commodore

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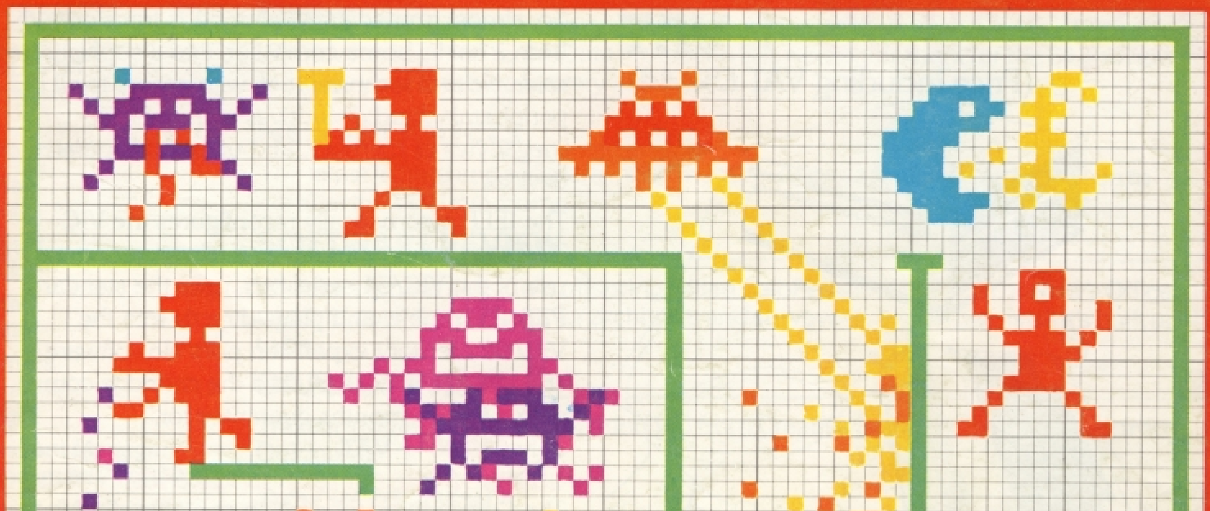
COMPUTING
INTERNATIONAL



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The independent magazine for all Commodore computer users

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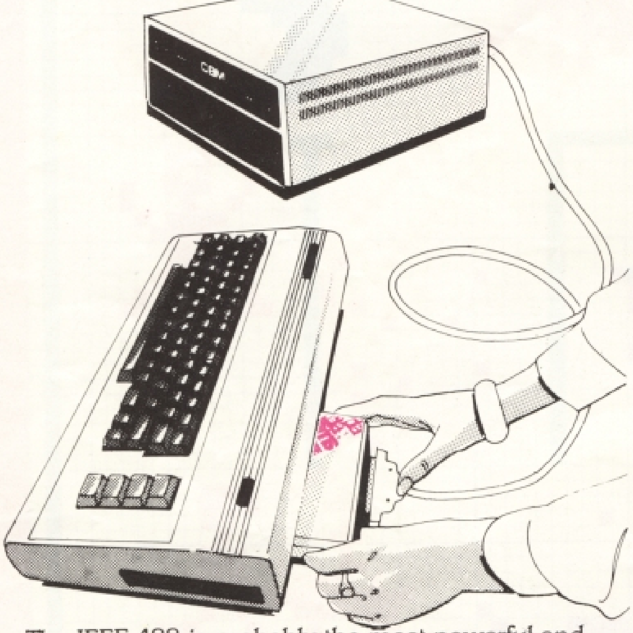

The IEEE 488 is probably the most powerful and flexible of all interfaces and at DAMS we have now harnessed it into a special cartridge, which plugs easily into the back of your VIC 20 or Commodore 64 computer, allowing for the connection of all peripherals previously associated with the PET range to the VIC!

This new and revolutionary step has enormous benefits for the scientific or educational user. Most electronic instruments can be interfaced, via IEEE to 64, and in a classroom situation up to 15 VIC/64 computers can be connected to one central disk drive.

So, almost immediately, your 64 is transformed from a basic, home computer, into a sophisticated scientific and technical tool, with access to all PET peripherals, hard disk drives with up to 30 megabytes of memory, and up to 15 separate devices.

The IEEE automatically reconfigures the VIC 20/64 to input/output use, it allows simultaneous use of the VIC/64 serial bus, uses the standard PET/IEEE cable, and plugs directly into the VIC/64 memory expansion port. No software changes are necessary, and the cartridge comes with a full, 12 months guarantee for, only **£49.95 + VAT.**

COMMODORE 64, IEEE INTERFACE

The Commodore 64 version contains all of the benefits associated with the VIC 20, but also has:

- Automatically relocating code to allow plug-in cartridge programs.
- Reproduction of Commodore 64's memory expansion slot to allow you to use ROM based business software.

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DAMS Office Equipment Ltd. (hereinafter called the 'company') warrants the products it sells against defects in material and workmanship for a period of one year from the date of purchase.
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JULY 1983

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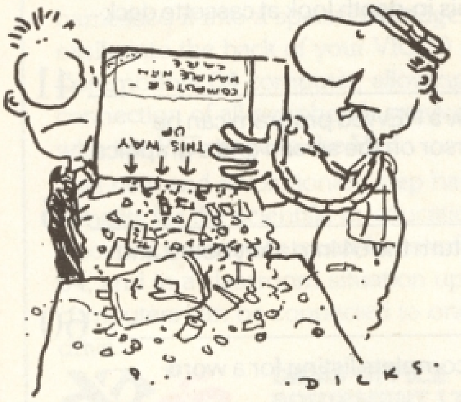
NEWS

A Taxing System

According to Anne Lavies and Gordon McClure, Microtax is "a revolution in coping with that dreaded income tax return." They are the tax consultants who actually developed the system which can be used on any popular micro. The system is currently available for the VIC 20 with 16K RAM, the 64 and the PET 400 series and the programs themselves come on either tape or disk. They work on a simple question and answer basis telling you what to fill in, advising you on your tax and calculating your total tax liability for the year. Neither does the system stop there, because the system also has the facility to provide the user with all the details required by the '83/84 tax return which is different from the tax liability for the current year in that it deals with the return of income for the previous tax year plus a claim for any tax allowances.

In addition to providing home computer users with an effective system for completing their tax returns, Microtax can also act as a financial planning adviser. Thus, the tax benefits (or otherwise) can be calculated if you want to operate a company car system or it might be financially advantageous if your wife's earnings were taxed jointly instead of separately.



It should also be of interest to note that several complementary systems are to be made available later on this year. These include a rather more detailed examination of business and professional income taxation as well as a separate system to cover capital gains tax. These will all be available from Microtax Ltd., Barratt House, 4th Floor, 7 Chertsey Road, Woking, Surrey GU21 5AB, telephone 04862 20369.

License to Copy

Owing to the recent election, it's likely the Data Protection Bill will be shelved for the next few months. However there is another organisation called the Association of Database Producers which is showing concern over another legal matter. With a straightforward teletype terminal the host computer knows what is going on at the other end because it is in control, whereas with a micro it is possible for the end-user to dump downloaded information without the host computer realising. Recording information in such an unauthorised way is a breach of copyright and illegal.

The problem is highlighted in a report published by Keynote Publications called 'On-line Databases' available at £60. The report puts the cause of the problem at the diversification of subject matter and the huge increase in the number of information providers which includes managers and scientists in different fields who have themselves come across difficulties. However, to gain such illegal access to information, such users have to know the criteria required to gain the information needed. Obviously this is still an unsatisfactory state of affairs and several efforts are being made to improve this. The ADP are considering issuing licenses to end-users enabling them to copy onto disk legally, whilst another possible solution is to create a system that acts as a directory that would make hosts and their databases transparent to the user.

For further information contact:
The Association of Database Producers, % Geosystems, PO Box 1024, London SW1. Telephone: 01-637 0471.

Coming Soon . . .

A little bit of advanced news for users of the Commodore 64 machine. A new company is being set up called Six Four Software who intend to specialise in products for the 64 only at the serious end of the Commodore range. In fact this company is so new that they are still looking for warehouses and offices although they will probably be set up somewhere in Canterbury. One or two things are final though. Initially they will be operating through mail order only and some of their products will be imported from America.

Extended Support

Digital Computer Services, a nationwide third party hardware maintenance and engineering support service for computer users, manufacturers and dealers, has extended its national service centre at Wigan to include a computer demonstration area for first time buyers of mini and microcomputer systems and peripherals. The company, which operates from support centres in Carlisle, Leeds, Wolverhampton and Wokingham as well as Wigan, also offers both on-site and off-site service on a contract and call-out basis. Besides their maintenance agreement scheme, which covers Commodore machines, other areas in which DCS operate include the design and installation of data networks and a total environment package designed to satisfy the requirements of site surveys carried out by manufacturer's engineers. For further information telephone 0942 321153.

Double Time

BFI Electronics, UK distributors of Verbatim disks, have announced that the latter firm are trying to increase their share of the floppy disk market. Part of this effort is formed by the availability of two-disk packs for retail outlets which are designed to appeal to the small users who can only buy disks boxed in packs of 10's. These 5¼" disks, suitable for most of the personal computer disk drives currently available, are taken from the Datalife series. The disk packs for retail outlets will be accompanied with posters and special point-of-sale dispensers. Peter Jarvis, the Sales Manager of BFI's Computer Products Division, says that their present push on the retail/dealer market gives them "great hope of taking a major part of available 'end-user' business in the UK."

NEWS

TAXADVICE
-PACK BAGS
-LEAVE COUNTRY
DICKS

Insuring Protection

The insurance brokers Graham Brown and Company may not be a household name but some personal computers are and, according to Brown and Co., half of all the personal computers in use in this country may be beyond their protection from manufacturers guarantees. Brown and Co. have therefore introduced an insurance scheme for personal computers which lasts for as long as the equipment is owned. The basic rules of the scheme are that no computer or peripheral is eligible to be included if it is more than two years old and the cost of the scheme is £7.50 per year for a system worth £100, the cost increasing with the value of the equipment. The annual cost for a system worth £500 would be £15 and such insurance provides what Brown and Co. call an 'all risks' cover against internal breakdown and accidental loss or damage, including damage during transit. Full details can be obtained from Graham Brown and Co. (Guildford) Ltd., Pannells Court, Guildford, Surrey GU1 4EY, telephone 0483 65651.

Award Winning Program

The microcomputer software publisher, Dataview, have been awarded the ICP Million Dollar Award for 1983 and to celebrate this achievement they have released a new version of Wordcraft for the 8096. As well as having calculator facilities, there is a fill file which accepts entries on the basis of certain specific criteria. Previous versions of Wordcraft allowed the user to select entries from a fill file by specifying the page numbers of the entries required. Along with this, files which are not specifically for Wordcraft may be used to fill document blanks making it simple for other programs to produce fill files for use with Wordcraft. There is keyword security for documents and the ability to print the short form of the disk directory. There is definitely an improvement in this version as far as printers and modems are concerned as well, because the program now supports parallel printers on the user port and the Commodore 8010 acoustic coupler modem is no longer the only one that can link Wordcraft systems.

Accompanying this there will be a tutorial system for the first time users, called the Self Instruction System (SIS) which is made up of three things. First of all there is the essential information in the technical manual which should be used mainly as a reference guide for when more detailed information is required. More important at the early learning stage are the work cards and the problems booklet. The work cards really form an illustrated procedure booklet which often refers to a set of problems outlined in the problems booklet. Although Dataview will be holding their price at £425 existing users of the 8096 version can upgrade theirs for a nominal price.

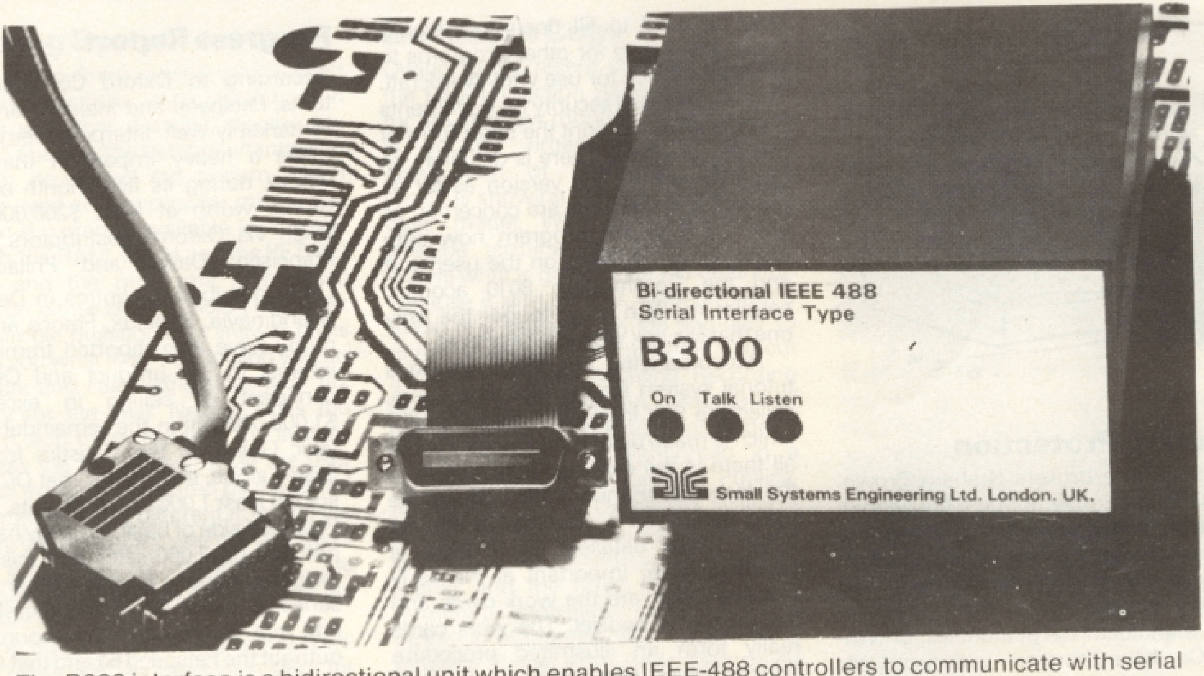
Progress Report

According to Oxford Computer Systems, Petspeed and Interpod are doing remarkably well. Interpod seems set to make a heavy impact in the States where, during its first month of issue, orders worth at least $200,000 were taken via Oxford's distributors in San Francisco, Dallas and Philadelphia. Other distribution centres in Denmark, Scandinavia, Benelux, France and Germany have also reported tremendous interest in the product and OCS are confident of selling in excess of $1,000,000 within the remainder of this year. Going by the statistics from the States alone, this means that OCS have sold at least 1,000 Interpod units. On the Petspeed side of business, they have just notched up 2,000 sales and this figure includes versions for the 4000 and 8000 series. It is not surprising therefore to find that Commodore have purchased outright the Petspeed 64 and that Oxford have just announced versions for the newly launched 500 and 700 series. Which just goes to prove once again the immense popularity and success of Commodore machines and good, honest software.

Alexander, the Eight?

You may remember that a few weeks ago, Virgin Games were crying out for programmers. The company, formed in February this year, launched a nationwide search for original game programs. Well, it now looks as if the original shortage is over. According to their managing director, Nick Alexander, there was a tremendous response to their appeal with over 500 games being sent in. That vast number has now been whittled down to just eight, all of which are due for imminent release. The trouble is that Virgin are being rather secretive about what the games actually are.

TYPE B300
IEEE-488 SERIAL INTERFACE



The B300 interface is a bidirectional unit which enables IEEE-488 controllers to communicate with serial devices such as KSR terminals, modems, laboratory instruments and other computer systems. The B300 replaces the SSE type B and B200 bidirectional interfaces. It is fully compatible with both earlier units in that it incorporates both software selectable and switch selectable Baud rate control. This flexibility has been achieved by designing the unit around an 8748 single chip microprocessor. The 8784 also provides a 40 character input buffer which provides flexibility in handling high speed data input.

Specification
IEEE-488 functions: Source Handshake (SH), Acceptor Handshake (AH), Talker (T), Listener (L) and Extended Listener (LE).

Switch selectable options
Parity—ODD/EVEN
Parity—Enable/Disable
Baud Rates—110, 300, 1200, 9600
Talk Addresses—4, 5, 6, 7
Listen addresses—4, 5, 6, 7
Code Conversion—Mode A/B
No. of Data Bits—7/8

Software selectable options
Baud Rate selection using a secondary listen address followed by a configuring byte which sets input baud rates. 16 different baud rates in the range 50-19,200 baud can be selected. Input and output baud rates can be set to different values.

RS232C signals
Transmitted Data, Receive Data, Request to Send, Clear to Send, Data Terminal Ready.

Connectors
IEEE-488 lead—24 way male ribbon connector. Female 24 way ribbon and an edge connector to fit PETs IEEE port supplied as options.
RS232 lead—25 way D-Type connector (male or female).

Packaging
The B300 is housed in a small instrument case with integral power suppies. ON, LISTEN and Talk indicators are provided on the front panel.

Options
20mA opto-isolated current loop adapter mounted in a D-type connector shell which provides active or passive current loop 10.
Communications PROM—designed to optimise the B300's performance with the INTERCOMM general purpose asynchronous communications package.

Warranty
90 days against defective workmanship or component failure under normal operating conditions.

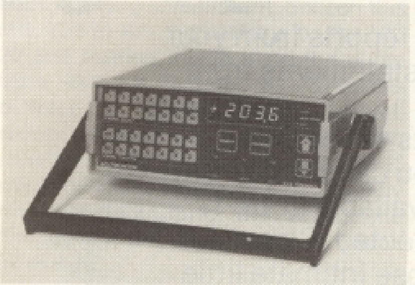
Prices

B300	£186.00
Current Loop Adaptor	£25.00

small systems engineering limited
2-4 Canfield Place, London NW6 3BT. Telephone: 328 7145 Telex 264538

NEWS

NEW PRODUCTS

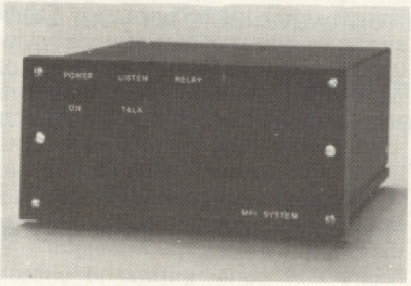


A Couple of Gems

CIL have released two new products of general interest to the computer market. The first is called the Multi-Monitor TA880 which is for the multi-purpose monitoring of thermocouples and volts with output simulation of thermocouples and millivolts. The system is operative on a computer or printer terminal, the IEEE control being allocated on 4K of EPROM. In all, there is 12K EPROM, the remainder being taken up by thermocouple tables, simulation programs and automatic calibration. Although there is a total of 16 channels, only 14 of these are available for input/output routines. The remaining channels are taken up by the system's self-checking system. These two channels act as a form of reference guide so, providing they are not occupied, they are always automatically set to zero. Ten of the input channels and two of the output channels are sited at the back with a maximum I/O range of + or − 100mV and one input and one output at the front with a range of + or − 10V. Incorporated in the price of £850 plus VAT is an A/D and D/A 16 bit digital converter. The whole system is based around the Z80 microprocessor and operates off 110 to 120 Volts AC.

The second product they have released is the Multi Function Instrument 1000 with control or terminal activity via the RS232. A command on the interface means that the computer acts as a 'passive partner' merely telling the device to be a multiplier, recorder, monitor etc. This system costs £180 and has eight analog inputs, one analog output and one changeover relay contact. Again, this little gem is based around the Z80.

Area: *Monitors*
Company: *CIL Microsystems Ltd.*
Address: *Decoy Road, Worthing,*
Sussex, BN14 8ND
Tel: *0903 210474*



Junior Choice

There are a couple of new educational programs designed for the 64 and 20 coming from Marketing Micro Software Ltd. One of the items they have come up with should be of interest to all budding musicians. Called 'Composer,' the screen displays a set of 44 notes which can be recorded on a datasette recorder by entering certain digits from one to nine. This is designed for simple melodies only as it has a range of only two or three octaves. The notes can play for the exact length of time that the key is pressed unless programmed otherwise. 'Maths Duel' is aimed at developing mathematical skills in addition, subtraction, multiplication and divisions at basic, intermediate and advanced levels. Of course, when you overcome one level of difficulty, the problems do not stop there as you will automatically be advanced on to the next level. Their other educational program is called 'VIC Sketch' which operates either from the keyboard or joystick. Drawings make use of seven colours. Many such educational programs are aimed at young children for developing co-ordination skills. This latter program is no exception.

Area: *Education*
Company: *Marketing Micro Software Ltd.*
Address: *Whitehouse Industrial Estate,*
Ipswich, Suffolk
Tel: *0473 462721*

New Service

Jentech Services Ltd. have started to split up their services in Shropshire and by the end of the year they hope to have five shops in operation probably in Shrewsbury, Birmingham and Bristol. There are two reasons for the expansion, one of which is the dramatic increase in the popularity of the home computer. The second concerns their operations in Nordley, Shropshire, where they came to the conclusion that selling both home and business computers from the same place was incompatible. They found that whereas the home computer hobbyist could sew up a satisfactory deal within half an hour, the businessman needed about three hours; meaning the time demanded by one sale held back the progress of sales on home computers. It is the home computer side of the business that is to be moved onto the high streets around the country and these shops will hold in stock the VIC, 64 and a range of peripherals such as printers, disk drives, stationery, computer magazines and books. Commodore business computers, like the 8000 series, will not be held in stock at these shops but they can be ordered. Jentech have also announced that Digitmaster, which is a Commodore approved product, will now be available as a two screen version upgraded to provide all the functions offered by minicomputers.

New Equipment for the 64

At long last some equipment is starting to come in for the 64. PractiCalc is a spreadsheet for the 64 and 20 and is being offered by Marketing Micro Software Ltd. Available on either disc or cassette, there is an impressive sounding four colour display and the possibility of performing 20 or more mathematical calculations which includes all the BASIC functions, an example of this being the simultaneous evaluation of the factors needed to calculate the best value for money from a range of different insurance policies. The program is written in a combination of machine code and BASIC and along with a graphics facility and an alphabetical and numerical sort, there is also a seek and search which can be applied to individual areas or through-

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As a Data Terminal, producing perfect letters and reports from your favourite wordprocessor or impeccable invoices and statements from your trusty business system.

During non-computing periods, SCRIPTA II reverts to the finest electronic typewriter. Depending upon your mood, you can choose any one of 20 Whisper-disk daisy typewheels which are available in 10, 12, 15 and proportional pitch. Numerous fonts can be selected. Classic Gothic or Modern Pica for business, Fine Italic for those intimate little personal messages, Cubic for the chic replies, or Lecturer – the large character – for prompting you during speeches or sermons!

An optional tractor or sheet feeder can be easily fitted or removed at any time to handle all types of documents, forms or letter heads.

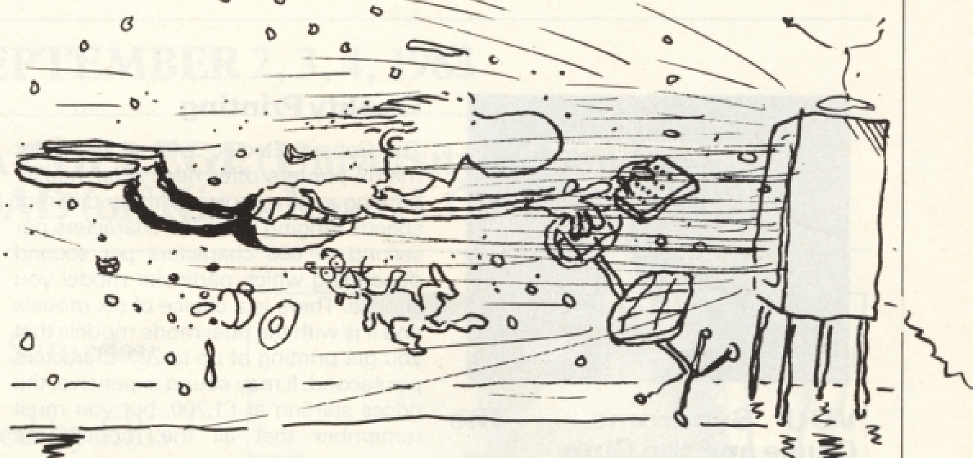
SCRIPTA II is a true dual purpose peripheral produced by Europe's largest office equipment supplier – it is not a typewriter modified by some electronic wizard! The product is eligible for an annually renewable on-site Service Contract carried out by the Manufacturer, including all parts and labour. A rare thing these days!

Just plug the SCRIPTA II into the mains and connect your data cable to its input port. Wordcraft, Word-Pro, Silicon Office, The Manager – in fact most software currently available for your Commodore machine, is readily configurable.

Should you require further convincing that SCRIPTA II is the ONLY terminal for your system, contact your Dealer, or write, ring or call Sole U.K. Distributor –

DATAPLUS Dataplus Ltd., 39/49 Roman Road, Cheltenham, GL51 8QQ,
Tel: 0242-30030, Telex: 43594.

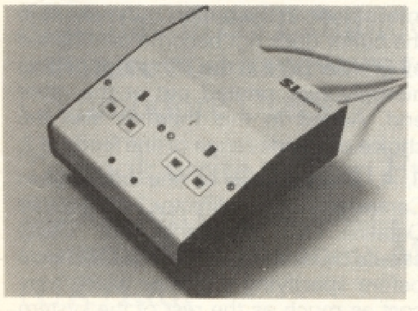
SCRIPTA
commodore
CBM
SCRIPTA II



out the whole spreadsheet. Sixteen K is required to run the package on the VIC 20 and bearing this in mind the quote from Richard Sumner, MMS's sales director, that "For the first time, spreadsheet software has caught up with recent developments in hardware," might be a little far-fetched, but for only £29.95 and £24.95 for disc or cassette respectively, this should be good value for money.

Two for the Home

SJ Research have had several products featured in the recent BBC television series 'Making the Most of the Micro' one of which is a computer controlled on/off switch for two 13Amp circuits. All the user has to do is plug the appliance that is to be controlled in to the socket at the front of the unit and then supply power to the unit from any 13Amp wall outlet. Any output port can be used for the control but the one that is normally used is the parallel user port or printer output. For something a little more complex than making the toast, SJ have developed what they call an Intelligent Controller to control the dimming and fading of up to 32 lighting channels and it attaches to the standard printer ports using either Centronics parallel or RS232/423 serial. Either device may be driven from Basic using ordinary Print statements. The basic double relay unit, R2, cost £29.95 and each product has the facility to form a master-slave relationship with several units connected to the same port. Thus at any time of night or day, you can control the television, radio, lighting, heating, coffee pot…



Area: *Home applications*
Company: *SJ Research*
Address: *108 Mill Road, Cambridge,*
CB1 2BD
Tel: *0223 69927*

Engineering Brief

Heating and air conditioning engineers who want fast access to details of all the available equipment in their field may be interested in a software package from Lennox Industries in the United States.

Lennox have developed a system called Micro-LOGIC (Lennox Objective Guide to Installation Comparisons) which enables architects and engineers to check on the capacity and energy usage of heaters, ventilators and air conditioning equipment. The programs are designed for use with the Commodore 8032 and 8050 disk drive.

Engineers designing systems for offices and factories need to know what equipment will give them a particular heating or cooling range, how much energy it will consume, what that energy will cost and what the life cycle of the equipment will be. Thanks to Lennox, they can brief themselves with Micro-LOGIC instead of wading through sheafs of pamphlets.

Lennox's primary market is the heavy construction industry, but they also cater for the engineer who designs heating and ventilating systems for small factories and homes. The user will even find information here on solar heating equipment.

A package of seven LOGIC programs costs $650 (£440). A $30 user's manual is available to enable customers to study the programs before they decide which ones to buy. The $30 is then refunded.

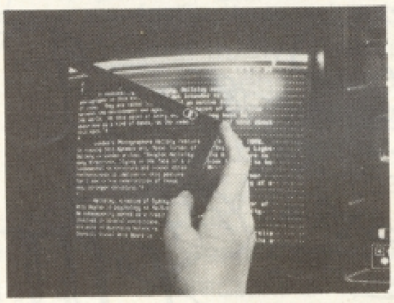
The systems detailed in the programs are produced in America, but much of the equipment is available in the UK through subsidiaries and agents. UK engineers who have access to 8032 computers can therefore apply the programs to their own projects.

Area: *Industrial programs.*
Company: *Lennox Industries Inc.*
Address: *PO Box 400450, Dallas, Texas*
75240, USA.
Tel: *(214) 783-5455.*

Packaged for Business

The good news from Simple Software is that the word processor called Simply Write – which has proved to be extremely popular on the PET/CBM since its launch in 1981 – has now been completely rewritten for the 64 and is also available for the VIC 20. This new version has all the features of its predecessor, adding colour and function key operations which are designed to make it simpler to use. The package comes complete with mail-merge and the ability to load and join stored files and the makers say it is ideal for use in compiling business letters, reports and essays. Cost of the package is £35 for the tape and £40 for the disk, (VAT not included) and can be obtained from dealers or direct from Simple Software. Its sister program, the DBMS Simply File for 64, has had its release date held back because the documentation is incomplete.

Area: *Word processing*
Company: *Simple Software Ltd.,*
Address: *15 Havelock Road, Brighton,*
Sussex BN1 6GL
Tel: *0273 504879*



VDU Syndrome — The Cause and the Cure

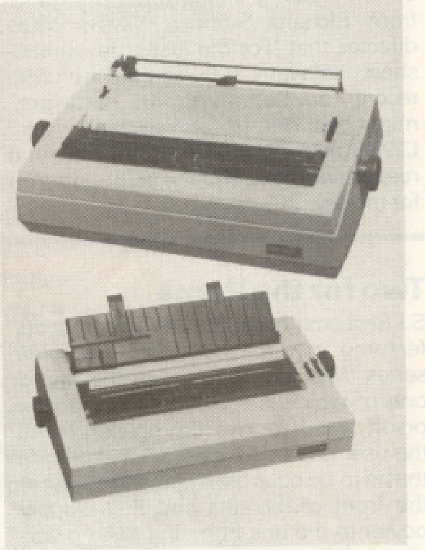
The symptoms are headache, stiff neck, tense muscles, eye strain and fatigue and these are all lumped together to produce what has become known as 'VDU Syndrome,' a common problem amongst operators of computers and word processing terminals. If you are fed up with making continual visits to the doctors, why not check out the Polaroid CP-70 Contrast Enhancement Filter, which is distributed in Britain and Europe by Cave Tab. The CP-70 is a polarized filter which is attached to the screen via some self-adhesive mounts, the principle used is the same as is employed with the famous sunglasses. With any VDU, normal room light passes through the filter to the screen but as the rays bounce back off the screen they become trapped and absorbed by the polarizer thus eliminating any glare. To prevent the filter itself causing any reflections, the filter is coated with an anti-reflective coating. The cost of the filter is £76 and is available in a variety of sizes. Neither does it need much in the way of maintenance apart from the occasional cleaning and with this in mind it is important that the filter is cleaned with the right solution as some cleaners contain solvents which could damage the anti-reflective coating. Each filter is supplied with a pack of Polaroid cleaning fluid. With over a million terminals now in use, Cave Tab are confident that a high proportion of users will soon be using the filter.

Area: *Home accessories*
Company: *C.W. Cave and Tab Ltd.*
Address: *Tenter Road, Moulton Park,*
Northampton NN3 1PZ
Tel: *0604 47238*

Quality Printing

The General Electric 3000 series of dot matrix printers offer near letter quality printing with a choice of three different speeds ranging from 100 characters per second to 500 characters per second depending which particular model you choose. There is a choice of six models and it is with the dual mode models that you get printing of up to 200 characters per second. It may sound expensive, the prices starting at £1,700, but you must remember that all the models are equipped with EDP and word processing capabilities and there is also a choice of either 86 or 136 column designs with a 72 × 72 dot per inch graphics. The print mechanism consists of either nine or eighteen needle printheads and amongst the features are built-in tractors as well as a tear-off bar.

For extras you can choose from an automatic sheetfeed, a Centronics parallel interface, document inserter and multi-colour printing. Full details can be obtained from ISG Data Sales Ltd., Unit Five, Wellington Industrial Estate, Basingstoke Road, Spencers Wood, Reading, Berks. RG7 1AW telephone 0734 884666.



Whilst we are still on the subject of printers, Hestair Dataline Ltd., in Leicester, are currently promoting their fast letter quality daisywheel printers. The machines they are offering are the Dataline RP1600 and the Dataline RP1300. The printers are manufactured by Ricoh and, with Dataline software, can be either Centronics compatible, IEEE or RS232C Serial for the same cost on either model. Both offer a range of features which are fitted as standard. For instance, there is an 8K buffer with an optional 16K available. There is also the usual bi-directional printing and operator control over the pitch and line feed.

Should you become rather tired of printing and wish to perform other tasks, all you have to do is press down the pause button to temporarily retain information in the buffer; but make sure the buffer does not become overloaded otherwise there is the danger of getting hieroglyphics printed out at the other end. Added to this there is also the choice of a wide range of line feeds of 2, 3, 4, 6 or 8 lines to the inch. Kevin Cartwright, the director of Hestair Dataline Ltd., comments that "Users should be clear about their requirements before specifying a printer which may cost as much as the rest of the system put together and these considerations should include the quality of output required, the speed of output and the type of interface required. The Dataline RP1600 and RP1300 printers represent a cost effective alternative to competing models with some unique advantages for word processing or general computer use."

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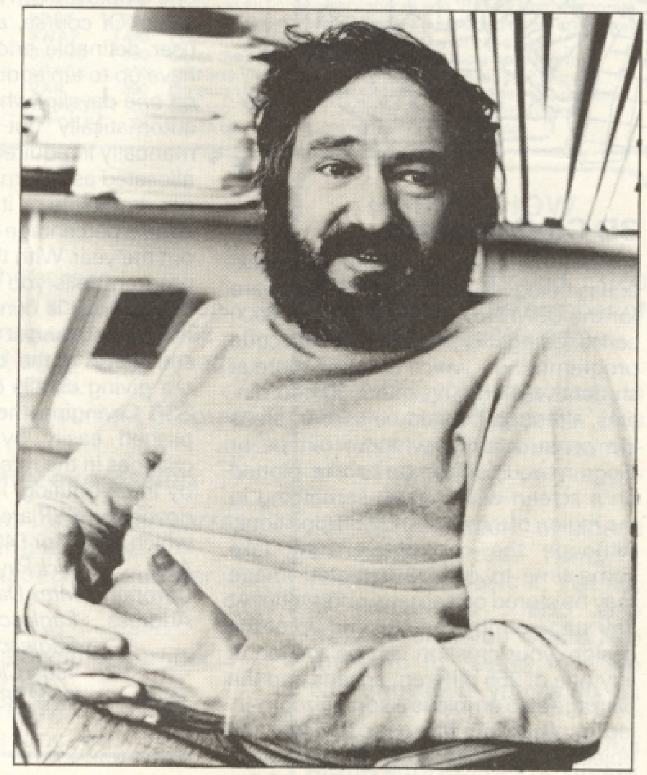

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Professor Seymour Papert

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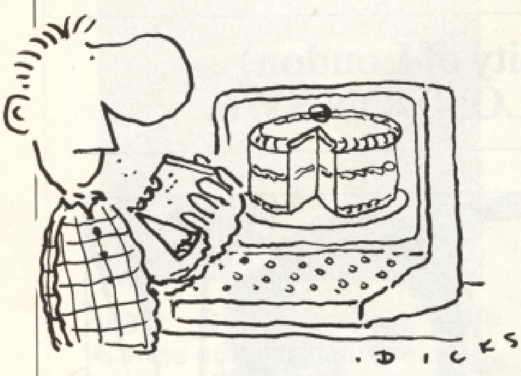
NEWS

NEW PRODUCTS



3D Co-Ordinates

A new three-dimensional graphics package is being issued by Hodkin Software for the CBM New ROM, 4000 and 8000 series. Using this piece of machine code programming – which is aimed more at students wishing to explore 3D coordinates, although it could be used in areas like construction – whatever shape or diagram you conjure up can be plotted on a screen which gives something in the region of 3 million plotable positions. Although the coordinates may take some time to plot, the created image may be stored on cassette or diskette. At any stage during the building up of the design, your creation can be rotated at any one of 255 different speeds and the package also employs a sort of 'zoom-in' facility enabling the user to view the object either close up or at a distance. This package is available direct from Hodkin Software and costs £14.50 for the New Rom and 4000 series and £18.50 for the 8000.

Area: *Graphics*
Company: *Hodkin Software*
Address: *Greenfields, Hammerwood,*
East Grinstead, Sussex
RH19 3QE
Tel: *034-286 603*

Bonus for Employers

From the authors of Payroll-200 and Micropay-200, comes a new CBM package called Bonus, a piece of software that deals with SSP. For the 8000 series, the program keeps a record of the amount of SSP an employee receives and the number of days paid. A diary is kept for each employee relating to attendance, sickness and absence for each worker. Not only this, but Bonus also caters for an hourly rate of pay, plus ten different overtime rates although one employee can only qualify for five of these. Of course, all of these rates are user definable and any employee can have up to ten additions and deductions on one payslip, which can be dealt with automatically but can be overridden manually if required. Holiday pay can be allocated as a number of hours per year per employee or it can be accrued as a certain percentage of gross pay throughout the year. With the former option, the program tells you when an employee's holiday pay is complete. At the end of each month and at the end of each year a summary of the operations is printed out giving details of tax, insurance and SSP. Changing the tax code is accomplished easily by the user, but any changes in the rate of tax has to be done by Intex Datalog. All of the DHSS rules governing SSP are built into the system which retails for £400.

Area: *Sick Pay*
Company: *Intex Datalog*
Address: *Eaglescliffe Industrial Estate,*
Eaglescliffe, Stockton-on-Tees, Cleveland, TS16 0PN
Tel: *0642 781193*

Keep it Clean!

International Data Automation have recently announced the availability of another PerfectData Type Element Cleaning Kit designed to clean the print element in the daisywheel printers. The manufacturers claim that this kit offers the user a completely safe and effective tool to be used in any industrial, office or home environment without fear of soiling clothes or spilling any solution on essential equipment. The kit, which has a suggested retail price of £17.75, consists of the actual cleaning instrument along with a 4oz bottle of cleansing solution. Each kit, say the makers, should provide enough solution for approximately 25 cleanings.

Area: *Cleaning*
Company: *International Data Automation Ltd.*
Address: *13 Station Parade, Virginia*
Water, Surrey GU25 4AB
Tel: *09904 4944*

APOLOGY

In a recent review on Micro Simplex, we made a number of errors concerning the Simplex Accounting System (on which Micro Simplex is based).

Far from being "much hated," "complex" and "difficult to keep up to date," it would appear that the Simplex D Account Book is the most popular on the market and its inbuilt simplicity has made it ideal for the small businessman and other self employed persons, who have no accountancy background. Very little effort is required to complete the book and take it through to the final accounts. In fact many thousands of users do just that and then make their own negotiations with H.M. Inspector of Taxes.

Its companion book, for VAT Records, was introduced after considerable thought and consultation with H.M. Customs & Excise. Essentially, it was necessary to publish a book which was capable of being used to record all the information needed for any *one* of the nine Retailers Schemes. The Simplex VAT Record Book does this.

The decision to keep VAT Records separately from the accountancy records kept in the Simplex D Account Book was based on the premise that

a) Many Simplex users are not registered for VAT and therefore have no need to keep VAT records.
b) To incorporate in the Simplex 'D' the information required for VAT, would defeat its object of providing a simple method of book-keeping.

Micro Simplex based on the Simplex System, provides a simple system of computerised accounting for those who require it.

Our remarks concerning the Simplex System were made without full knowledge of the Simplex System, and we regret any inconvenience caused by the errors in my article.

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APPROXIMATE MEMORY USAGE

AUTO	40	Provides automatic line numbering.	MON	10	Enters the CBM machine-code monitor.
BEEP	60	Plays music of given duration and pitch.	MOVE	130	Moves a block of memory to another position in RAM.
BLOAD	40	Loads in a block of memory without affecting BASIC execution.	NUMIN	740	Foolproof input routine for amounts of money.
BSAVE	120	Saves the memory area between two given addresses.	PCTRL	100	Set the device number and characteristics of the printer.
CALL	180	Enter a machine-code subroutine with given Acc,X- & Y-reg.	PLOT	170	Plots a double-density point on the screen.
CIF,CEND	220	Four commands which provide facilities for structured BASIC,	POP	30	Removes the last subroutine return address from the stack.
ELIF,ELSE		largely eliminating the need for the GOTO command.	PRINT	130	Adds routine to automatically right-justify amounts of money.
CURSOR	30	Places the cursor at position x,y on the screen.	PRINT	280	Modifies all printer-output as needed and adds TAB function.
DATIN	690	Foolproof input routine for dates with full error detection.	PUSH	60	Pushes a return address onto the stack.
DELETE	70	Deletes a given range of program lines.	RENU	930	Renumbers a program, altering all GOTO's, THEN's, etc.
DISABLE	50	Disables the run/stop key without affecting the internal clock.	REPEAT	50	Adds repeat key function.
DISP	140	Displays a prompting or warning message on a given line.	REPLACE	490	Replace all occurrences of one character string with another.
DREAD	100	Reads data from disk without input restrictions.	RESCUE	40	Recovers a program accidentally 'NEW'ed.
DSEARCH	330	Searches a disk relative-file for a given string or pattern.	RESET	170	Resets a double-density point on the screen.
DUMP	170	Outputs the names and values of all current scalar variables.	RESTORE	20	Restores DATA back to a given line number.
EDIT	70	Adds 'delete-forwards' function.	REVERSE	50	Reverses the field of the screen.
EXEC	140	Executes a string as a BASIC command.	SCAN	190	Scans a string for the next occurrence of a given character.
FIND	200	Lists all lines in which a given character string appears.	SCOPY	340	Copies the screen to the printer.
GENIN	700	General foolproof input routine with selected key disablement.	SCROLL	230	Scrolls screen contents up,down, left or right.
GSUB	110	Performs a GOSUB to a given labelled line.	SEARCH	270	Searches an array for a given string or pattern.
GTO	90	Performs a GOTO as above.	SHRINK	180	Removes all unnecessary spaces and 'REM's from a program.
INPUT	40	Allows a program to continue despite a null entry being input.	SORT	780	Sorts any one-dimensional array (and tags another array along)
INVERT	160	Turns a string back to front.	SWAP	440	Loads in another program, retaining all variables.
IRQ	60	Restores normal system use of interrupts.	SWIND	150	Saves the contents of the screen in a compressed format.
KILL	20	Takes out SOFTCHIP commands.	TRACE	110	Displays the last six line numbers at the top-right screen.
LINES	50	Calculates the number of lines in a program.	VAR	390	Outputs the names of all variables referred to in a program.
LWIND	170	Loads a screen display from a compressed format file.	WINDOW	30	Sets top, bottom, left, right for an 8032 screen window.
MERGE	360	Merges a program from tape or disk into the current program.	WPOKE	50	Pokes two memory locations in hi-lo 6502 order.

★ ★ NEW COMMANDS NOW AVAILABLE

BORDER	100	Draws a border around the edge of the screen
CLOCK	250	Continually displays the time at a given screen position.
GRAPH	20	Gives access to the box-drawing characters on an 8032
ON	50	Branches to program line corresponding to key pressed.
PROTECT	90	Allows regain of control after system crash.
STATS	120	Outputs the number of statements in the current program.

★ ★ NEW FUNCTIONS which may be used in any expression

AVG	140	Calculates the average of the elements in a numeric array.
BLANK	40	Tests a string : returns true if the string is blank.
DEC	80	Gives the decimal equivalent of a hexadecimal number.
FACT	60	Provides the factorial function.
GAMMA	90	Provides the gamma function.
HEX$	90	Gives the hexadecimal equivalent of a decimal number.
MAX	120	Returns the maximal element of an array.
MIN	120	Returns the minimal element of an array.
NORM	160	Provides the normal distribution area function.
PAD$	90	Pads a string with spaces.
QUME$	70	Assists high-resolution plotting on QUME Sprint 5 printer.
SHR$	260	Gives the compressed form of a number for compact storage.
SPC$	30	Gives a string of spaces of given length.
SUM	130	Returns the sum of elements of an array.
WPEEK	40	Peeks a two-byte address.
XPD	220	Decompresses a number.

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What will they think of next ?

SOFTWARE REVIEW

Tomorrow's office: is tomorrow being made today?

This month we take a look at three business packages for different areas of the computer market, one for the Commodore 64, one for the 8096 and one for the 8032. These cover financial forecasting, data base management, and cost estimation/quantity surveying, before moving onto a few games for the home computer user, with a look at a range of games for the Vic 20.

Once upon a time, someone invented the 6502 microprocessor, and people built microcomputers based on this very popular chip. As the systems grew and grew, so did the ideas of the original inventors, many of them experienced previously in using computers vastly more powerful and, it must be said, vastly more expensive.

There were a number of programs (packages, as they preferred to call them) which were an essential part of any computers repertoire : some would say vital. What could be done on one of the earlier mainframes could be done on these new-fangled microprocessors, they said. Of course, they wouldn't be as good, or as powerful, as the originals, but they would do the job to the best of the computer's ability.

And so were borne a vast number of 'office utilities', ranging from word processors, to payroll programs, and onto the ubiquitous Data Base Management Systems. It is this latter area that we'll concentrate on here.

Data base programs on monolithic multi-megabyte storage devices are of necessity rather different from the versions that originally began to appear on the first 8K PETs, but with 96K machines now available, and backup facilities extending onto hard disk and 30 megabytes of storage room, perhaps some kind of good approximation should be possible.

One of the first companies to write programs for the early PETs were Stage One Computers, with their PETAID suite of programs. This has grown up over the years, and changed out of all proportion to that first version, until we have a range of programs that all come together to form the package now known as Tomorrow's Office.

'Now known as', because it used to be called the Administrator. However, that name and the glossy leaflets and promotional brochures that went with it, all conspired to give the package something of a joke image : the brochures in particular were inept in the extreme. So, a revamped image and a revamped program. Is it worth purchasing for your business ?

What Is A Data Base?

To come to any sort of decision we must first decide whether or not it fits into our definition of a data base. That is, is it a package that effectively files information in an organised manner, regardless of the manner in which that information is input, and which can retrieve that information in a manner specified by the user and not restricted by the computer ? An arbitrary definition, but one which should serve to help us come to a decision. The user should control the package, and not the other way around.

In their own promotional literature, Stage One Computers call Tomorrow's Office a file, screen and report management system, but it all amounts to roughly the same thing as far as the end-user is concerned. You can describe a system in any way you choose, but words never (or should never) sell a package : its performance in day to day use is what matters.

Getting Going

Tomorrow's Office comes complete with a training manual, a system operating manual, two program disks (one system disk and one program disk), and our old friend the dongle, referred to in the manual as the data key. Presumably if you cross a dongle with a data key you get a donkey ?

As usual, your first action will be to make a security copy of the master disks you've been supplied with, and then lock those originals away in a safe place for later recall should anything happen to your copies.

After doing this, preferably using the training manual because it's written in English, and not the systems operating manual (it might as well be Eskimo as far as the beginner is concerned), you come across one of the shortcomings of the programs as a whole. It won't affect most people, but some it most definitely will, and this must be considered carefully before deciding whether or not to buy.

As soon as you first start to run the system you have to choose the date format required (i.e. in what way dates are to be entered into the computer), the disk system to be used and the printer system to be used. Once selected, you can only ever change the type of printer. Date format, and much more importantly the type of disk system, are unalterable once you've started. If you later decide to upgrade from (say) an 8050 to a hard disk drive, you can forget about using your existing records : they'll all have to be changed.

As with all packages of the data base genre, one of the first things you have to do is to define all the fields of information that you will be entering. This is also one of the most important things, as more often than not once you've started there is no going back (or if there is, as here, it is a lengthy process), and a set style will have to remain in operation throughout the lifetime of the package.

Tomorrow's Office works very like an electronic filing system. Your first entry in the file is the Master Card, akin to the very first file in a card-actioned system. If you were, for instance, setting up a stock control procedure, your first card would contain details of all the subsequent information that is to be entered. Record number one is the stock number, record two is the stock description, record three is the minimum order level, and so on.

The difference here from a manual system is that the information contents, once specified, cannot be changed. You can change the descriptions that go in there, but for obvious reasons (you'd have to change the entries for all the stock records in our stock control example) everything else must remain the same throughout the lifetime of the package. The field length for each description (up to a maximum of 254 characters : now there's a number!), the type of information that can go in there (alpha, date, numeric etc.) will have to stay as it is.

This, as you can see, is probably the most important part of using the product, and so should be given the most thought prior to putting into operation. Once you're satisfied, actually creating this master card is reasonably straightforward, including defining how the information is to be input, and we can go on to using the program proper.

Again, a theme running throughout Tomorrow's Office is 'programs in right hand drive, data in left'. As you can have one disk set up for every application (stock control, patient records, pigeon breeding etc.) the limit on your data is the capacity of your disk drive.

However, that is the overall limit on your data storage. What about individual limits for records, fields and files ?

A few definitions first of all, as they apply to Tomorrow's Office. A field is just one item of information, for example stock part number. A record is a collection of fields which all relate to the same sort of file (you'll be as confused as we were shortly), for example stock control as a whole. A file, as you might have guessed, is a collection of records, and finally we have a volume, which is a subset of a record. Each one of these can usually be subdivided or grouped together into a multi-volume, for instance, but we won't consider those here. It's getting complicated enough as it is.

Now then, as we've said earlier, a field can be up to 254 characters long. However, the maximum length of a record is also 254 characters (apart from a master record, which doubles up to 508 characters), so you'll have to be careful about defining field lengths. That 254 limit is the limit on information that can be entered, and does not include the actual description (e.g. stock part number).

The file size is limited only by the volume of the disk drive that you're using. On an 'ordinary' disk drive (8050, say) you can have an absolute maximum of 9000 master records, and up to 50000 transactions to each volume. A transaction, remember, is simply the historical part of a record attached to a master record, or in other words the daily changing information.

And if you understand all that, you'll be in a better position to operate the program than we were!It would be unfair to describe it as completely user-hostile, but it certainly doesn't welcome you with open arms and guide you gently along. For the first time user, if you're lost by now, go and ring up Compsoft, or the Bristol Software Factory, or someone else, but don't try using Tomorrow's Office!

However, if you're still with us, we'll take a look at setting up an actual working example.

Using the Programs

The training guide, which is far superior to the operating manual (unless you want to know precisely how, and why, the program works in the way it does : this should not be necessary for a data base package), gives a number of flow chart diagrams to help you choose the optimum path for setting up a complete working system.

A quick glance at these diagrams show that an awful lot of work is going to have to be put in to get a system which you can trust, and which will not need continuous reference to an existing manual system to ensure that all output is correct.

Obviously, a lot of time will be spent designing the original screen formats. To do this, a master record format must be created using option CM, and a similar transaction record format using CT. The mathematical routines which will be implemented later (for use in calculating numerical values in fields based on other fields) must be defined using MA.

We must then create the first volume of data (CR), and define the order in which the data will be input (OI), which to us was impossible to decide upon until a few trial runs were completed, and this subsequently meant doing the whole lot again.

Then enter a small number of test records using yet another menu option, check that it's all working correctly for this small amount of data that we've entered (needless to say, it probably won't!), and then go on to use the package properly, yes ?

No! Before proceeding further we must set up our report formats, bearing in mind all the information that we have already entered. Another half dozen menu programs come into play here, and by the time you've finished all this we're ready to go and do a fully fledged test run on the package, aren't we ?

Well, unfortunately not quite, but at least this one can't be blamed on Tomorrow's Office, and it does ensure that all your requirements are thought out before a 'real' run, and that all the parts of each format are in correct working order. It would be foolish to rush ahead when the package allows you to make absolutely sure it all works properly.

Our last few steps are to define any other processes that we might need. You might, and probably will, want to print out labels from within all this at some point, and routines such as this must be entered here. Why do you always have to think of everything first ? Finally, finally, you have to define your own user menus, so at least you'll know what you're doing, and define which jobs can be done automatically by the computer. A 'Learn' mode facilitates this, and cuts down the amount of manual work that will have to be done later.

Conclusion

Once you finally get going, the package does what it claims to do, and does it with a fair degree of competence. However, you have to be very sure of what you're doing before the package can be used in a real run-time situation, because any corrections are awkward, and time consuming, to make.

There are a number of options that we haven't covered here (links to word processors, sorting; which it does to disastrous effect on numerical data unless you have it properly formatted; the various search criteria that can be employed when scouting through records for a specific piece of information, and so on), but in a two page review we can't cover everything. Rather we have to give an impression of the package as a whole, not a detailed step-by-step guide.

It is not a package for the beginner to the world of computer data bases, and that type of user would be far better recommended to try something like Silicon Office, a much more efficient and friendly program : it runs on the same machine a well.

Not, I'm afraid, highly recommended.

Product:	*Tomorrow's Office*
Price:	*£695.00 plus VAT!!*
Area:	*Computer Data Base*
Configuration:	*8096, Disk Drive, Printer*
Company:	*SoSoft (Trading Name of Stage One Computers)*
Address:	*300 Ashley Rd., Parkstone, Poole, Dorset*
Tel:	*0202 735656*

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commodore

Calcresult

You're never alone with a clone, so they say, and Visicalc is certainly no exception to this rule.

Visicalc was the original spreadsheet program, appearing to an astonished world some years ago, and was probably the first program to prove that the Commodore PET could be taken seriously as a business computer.

If, at this point, you don't know what a spreadsheet program is, buy our April issue immediately and find out! If you do, read on.

The latest Son of Visicalc to appear, and perhaps the only one (so far) that has been an improvement on the original, is a program called CalcResult, from the Swedish firm Handic Software AD, and distributed in this country by Kobra MicroMarketing. Versions of it exist for the Commodore 8000 series and the Commodore 64, and it is the latter version we'll concern ourselves with here.

So, this month we'll take a look at CalcResult, and find out whether or not its worth paying the extra £50 and purchasing it, or settling for its more famous forebear at £120.

Getting Started

As usual, there is some kind of security device to go with the program, and although Handic choose to call it a cartridge, it is, to all intents and purposes, just another glorified dongle. Glorified, because it also contains a fair amount of code in its own right. Making copies of CalcResult is going to keep some pirates busy for quite a while!

Inserting the cartridge and switching everything on results in the message Insert Disk appearing on the screen, and from then until the usual spreadsheet format appears on the screen, you're totally in the hands of the computer.

So far so good, nothing too different yet. But, if you enter the User Register with the keystroke sequence Control-D-U (and try and find where that is in the manual!) you'll find an interesting display of the names in eight languages! Simply select the one you want, from a choice ranging from Swedish to English, through many others en route, and all subsequent messages will be displayed in that language. By the way, in case you don't know Suomeksi is Finnish! You can also, from this section, change the foreground, background and border colours if you want to, and select what type of printer you wish to use.

In terms of memory space, CalcResult soon shows itself to be far superior to the original Visicalc, purely because you've got more memory to play with. Up to 1500 cells (or locations, the area in which you put your calculations or results) can be stored in memory at any one time, which should normally be enough for several pages of information to be entered. CalcResult always works in pages, and you can define up to 32 of them. A page can be as big or as small as you like,but your ultimate memory limit is always those 1500 cells.

Since the program makes extensive use of disk storage whilst in operation, you can also use this as an active working storage area, and this effect gives you up to 5000 cells which you can control from within the main program.

Altogether, up to 32 pages can be defined, and any one of these can be called up at will without erasing the current work page. It was round about here that we encountered one of the faults of the manual.

It is excellent in presentation and appearance, but appears to have been translated from the original Swedish by someone whose knowledge of English was none too good, with the result that some of the paragraphs are a bit difficult to decipher. This is a serious criticism from the point of view of the first time user of the program, and is really the only flaw in the whole package. A shame that one small point should mar an otherwise excellent product.

However, if you have any doubts you can always refer to one of the many Guides to Visicalc currently available, as the similarity to that program extends even to the use of the various command keystrokes to perform the same functions. You can, needless to say, read existing Visicalc files and modify them to take advanage of the extra facilities that CalcResult offers, and then re-save them.

Visicalc Plus

In addition to the page facility mentioned earlier, CalcResult offers the user a number of other advantages over the existing Visicalc. Screen Splitting is more sophisticated, and you can have up to three different areas on display at the same time, all independently scrolling etc., and the screen can be split either horizontally or vertically. You can also define a window in the middle of the screen, and operate on that page separately of the others.

Title columns, usually the most important part of the entire screen, can be wider than any others, instead of having to follow the same universal rules. All column widths are capable of being altered when you wish to print out the contents of the screen. And finally, calculations can be performed on combinations of rows and/or columns, instead of being restricted to iust rows or columns.

The commands available are also a distinct improvement on Visicalc. The most powerful of these by far is the ability to include IF, THEN ... ELSE structures, as well as AND, OR ... NOT. You lose the lookup and choose functions, but do gain a random one, and a count one.

Finally, it has been made much more difficult to accidentally wipe out information from either the work area or the disk. Many 'ARE YOU SURE's appear, which can get irritating, but at least ensures that you won't lose the results of many hours hard labour.

Conclusion

Written entirely in Forth, although this is transparent to the user, CalcResult is as fast in operation as any spreadsheet program can be, and is a distinct improvement on the original program. Whether you think it is worth upgrading your existing system is, of course, up to you, but for anyone who has yet to buy a spreadsheet program, CalcResult certainly appears to be the best one currently available.

With this programming area reaching saturation, it's likely to remain so for some time to come.

Product:	*CalcResult 64*
Area:	*Financial Forecasting*
Price:	*£171.35*
Configuration:	*Commodore 64, Disk Drive*
Company:	*Kobra MicroMarketing*
Address:	*P.O. Box 28, Henley-on-Thames, Oxon RG9 1PF*
Tel:	*04912 2512*

SOFTWARE REVIEW

Microspec: a quality package for quantity surveyors?

'In the transition from mainframe to micro, will universally accepted packages survive the change?'

Microspec is intended to be used by architects and surveyors, and is a great advance on earlier packages that purported to achieve the same aims: Commodore's own Cost Estimation, for instance.

Hardware required consists of an 8032, an 8050 and a printer of some kind. An ordinary dot matrix printer will suffice, but if you belong to the kind of company that cares about the image that it presents to the outside world you'd do better to use a more expensive daisywheel, as much of the output is designed to be sent out to various clients.

Before acquiring your daisywheel though, do check it will work with Microspec, as they've made no concessions to the vast number of different printers – surprising in a package at this price – and you'd do well to try before you buy.

Program Aims

The aims of the program are as large as the price.

Its primary purpose is to produce a cost estimate, and an unpriced schedule of works. The latter is sent out to building contractors when tendering for work.

These two documents are based upon two things: a standard library of tasks (or jobs), which is updated and maintained through one of the many options in the main program, and the financial rate of each task.

Each task in the main library is referred back to a materials and workmanship list, which contains all the necessary details for each task. This, along with a printed copy of the preliminaries and conditions of contract, allows you to convert the earlier schedule of works into a full job specification provided you actually get the job in the first place.

Everything needing to be despatched either when tendering or submitting the full contract, is produced from just two places. The facts and figures come from the program itself, and the standard printed works (contract, form of tender etc.) are all available with the package, or for a nominal fee on a disk set up with a number of Wordcraft files. The latter is probably a more sensible option as it gives you the ability to amend the works as you see fit: not every company will fit into the same standard.

Getting Started

The manual is comprehensive in the extreme, and although not many novices would have enough spare cash to actually go out and buy a product as specialised as this, it is reassuring to know that you are well provided with documentation. However, we were a bit disconcerted when the front cover of the manual fell off!

It was unclear whether or not the demonstration disks that we had were a part of the whole package. One would assume that they are, and they provide valuable insight into the workings of it as a whole.

Security is by our old friend the dongle, plugging into the cassette port at the rear of the computer, and once you've made the essential backup copies of your program and library disks you're ready to go.

Storage Space

There is enough space on the disk for up to 500 tasks and all their relevant information to be stored, and the program allows you to search for a specific task on a number of keys.

Each task is specified by a three letter mnemonic relating to the kind of job it is, e.g. BRIckwork, CONcrete, and so on, and it is these three letters that form the key (sorry!) when looking for a given job. Each task must also have a four digit identifier. The description for each task can be up to 180 characters in total, and this can be used to give additional information to the builders etc. who will be reading and using it.

Finally, all the set descriptions, money rates, etc. can be modified by individual users as they see fit, so a degree of flexibility is allowed.

In Operation

The program is easy to use, and any newcomer to computing shouldn't have any difficulties in finding their way around.

It is also fairly fast (with all the hall-marks of being written in Basic, for easy development, and then compiled), and uses relative files for all its job and task storage. They adhere throughout to what must be the standard rule by now: programs in drive zero, data in drive one.

But, there are inconsistencies within it. The initial menu, which sends you off to one of seven options (library maintenance, library print, factor maintenance, job clause preparation, print out of cost estimate, print out of the summary of the cost estimate, and print out of the schedule of works), is number driven. That is, press number one for option one, and so on.

Everything after that is letter driven, using the usual technique of pressing the first letter of the word. Be consistent!

Also, there are at least two occurrences that haven't been checked for. On the initial menu, they will only let you press numbers 1 through 8 (8 for exiting from the system, which merely leaves the program), with two exceptions. Pressing TAB produces an interesting looking error message, and the well known method of getting into upper case/graphics mode (press both shift keys and the quotes) has not been stopped, with the result that your screen-display becomes a very untidy mess, and cannot be corrected without restarting the system.

Minor points perhaps, but when you pay £845 you expect these things to be taken care of.

Conclusion

A worthy package, that does everything it sets out to do, and moreover doing it with a reasonable degree of competence. It will make the life of any architect or surveyor who uses it a lot easier.

But, and it's a very big but, would any architect or surveyor be willing to part with £845 for this privilege? They're obviously well aware of what the market can take, but most software is vastly overpriced anyway, and Valtec are doing nothing to correct this. Sales and time will tell if they've done their pricing research properly.

Product:	*Microspec*
Area:	*Cost Estimation*
Price:	*£845.00*
Configuration:	*8032, 8050, printer*
Company:	*Valtec Ltd.*
Address:	*345 Gray's Inn Road,* *London WC1X 8PX*
Tel:	*01-833 0105/6*

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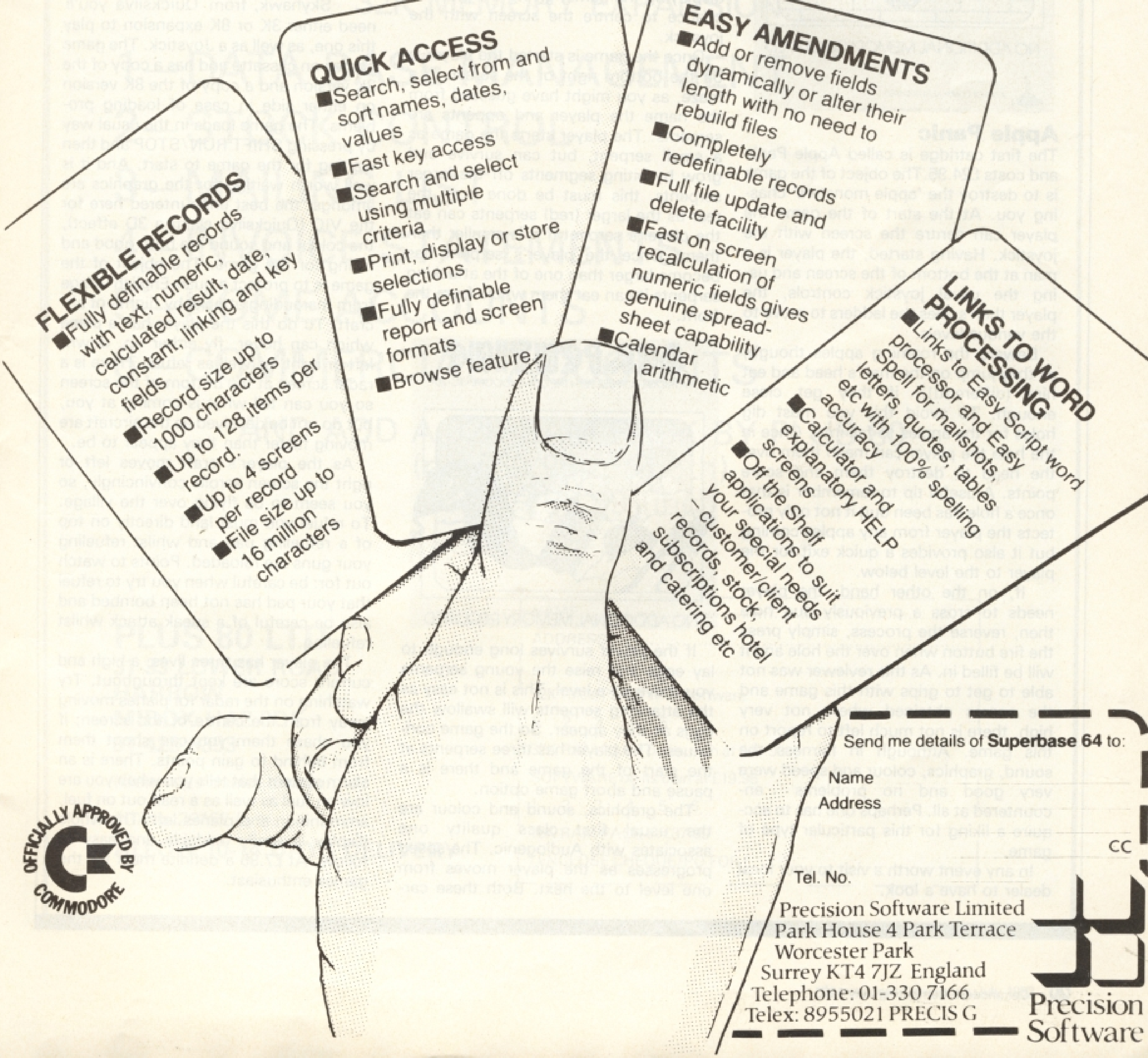

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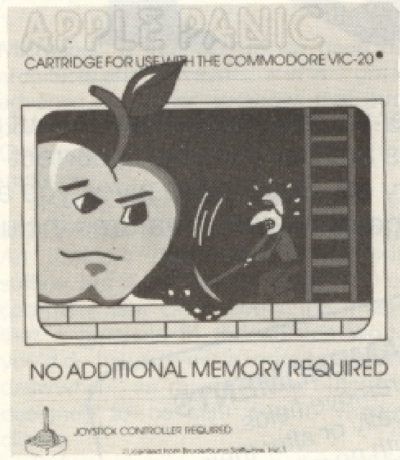
Telex: 8955021 PRECIS G

Precision Software

GAMES REVIEW

Two cartridges for the VIC from Creative Software and distributed by Audogenic. Both cartridges use a joystick, and run on the unexpanded VIC. To operate them one simply plugs the cartridge into the back of the expansion port on the VIC, switch on and away you go!


APPLE PANIC
CARTRIDGE FOR USE WITH THE COMMODORE VIC-20®
NO ADDITIONAL MEMORY REQUIRED
JOYSTICK CONTROLLER REQUIRED
Licensed from Broderbund Software, Inc.

Apple Panic

The first catridge is called Apple Panic and costs £24.95.The object of the game is to destroy the 'apple monsters' chasing you. At the start of the game the player can centre the screen with the joystick. Having started, the player is a man at the bottom of the screen and using the usual joystick controls, the player then scales the ladders to move to the various levels.

Beware the roaming apples though, as they jump on the man's head and eat him (different!!), if they get close enough. To avoid this you must dig holes for the apples to fall into. Once in the hole the player can mash them over the head to destroy them and score points. A useful tip to remember is that once a hole has been dug it not only protects the player from any apples coming but it also provides a quick exit for the player to the level below.

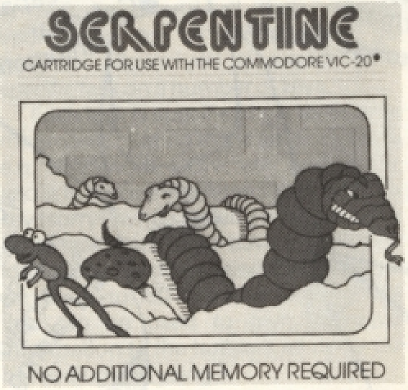
If, on the other hand, the player needs to cross a previously dug hole then, reverse the process, simply press the fire button when over the hole and it will be filled in. As this reviewer was not able to get to grips with this game and the scores obtained where not very high, there is not much left to report on this game. Although in fairness the sound, graphics, colour and speed were very good and no problems encountered at all. Perhaps one has to accquire a liking for this particular type of game.

In any event worth a visit to your local dealer to have a look.

Serpentine

The other cartridge was much better, one of those games it's hard to tear yourself away from. The cartridge is called Serpentine again from Creative Software and costing the same as Apple Panic. This one comes highly reccommended, there were no problems at all. The first point to mention is the interesting title display—a scrolling format that repeats, whilst playing an intro and displaying the game, giving the player a chance to centre the screen with the joystick.

Once the game is started the player is on the bottom right of the screen in a maze, as you might have guessed from the name the player and oppents are serpents. The player starts the game as a small serpent, but can survive and grow by biting segments off the larger serpents, this must be done from the rear as the larger (red) serpents can eat the player's serpent if it is smaller than them. Once the player's serpent has become larger than one of the attacking serpents it can eat them whole from the front.


SERPENTINE
CARTRIDGE FOR USE WITH THE COMMODORE VIC-20®
NO ADDITIONAL MEMORY REQUIRED

If the player survives long enough to lay eggs and raise the young serpents you move up a level. This is not easy as the attacking serpents will swallow the eggs as they appear. So the game continues. The player has three serpents at the start of the game and there is a pause and abort game option.

The graphics, sound and colour are the usual first class quality one associates with Audiogenic. The speed progresses as the player moves from one level to the next. Both these cartridges come well packaged and with adequate, though perhaps a little skimpy, instructions. As said earlier Serpentine does come highly recommended, definitley worth the trip to the dealers and the price of the cartridges.

Skyhawk

Skyhawk, from Quicksilva you'll need either 3K or 8K expansion to play this one, as well as a Joystick. The game comes on cassette and has a copy of the 3K version and a copy of the 8K version on either side in case of loading problems. The game loads in the usual way by pressing SHIFT RUN/STOP and then waiting for the game to start. And it is well worth waiting for the graphics are amongst the best encountered here for the VIC (Quicksilva claim a 3D effect), the colour and sound are both good and fitting for the game. The object of the game is to protect a quiet English village from marauding attacks by flights of aircraft. To do this the player has a plane which can hover, fly either up, down, left or right, as well as refuel. There is a radar screen at the bottom of the screen so you can tell what is coming at you, but do not be deceived as the aircraft are moving faster than they appear to be.

As the player's craft moves left or right the screen scrolls convincingly, so you seem to be flying over the village. To refuel you must land directly on top of a refueling pad and whilst refueling your guns are reloaded. Points to watch out for: be careful when you try to refuel that your pad has not been bombed and also be careful of a sneak attack whilst refueling.

The player has three lives, a high and current score are kept throughout. Try watching on the radar for planes moving away from the centre of the screen; if you chase them you can shoot them from behind to gain points. There is an alarm system that tells you when you are low on fuel as well as a read out on fuel, ammunition and planes left. The whole display is easily readable and easy to follow. At £7.95 a definite must for the games enthusiast.

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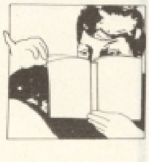
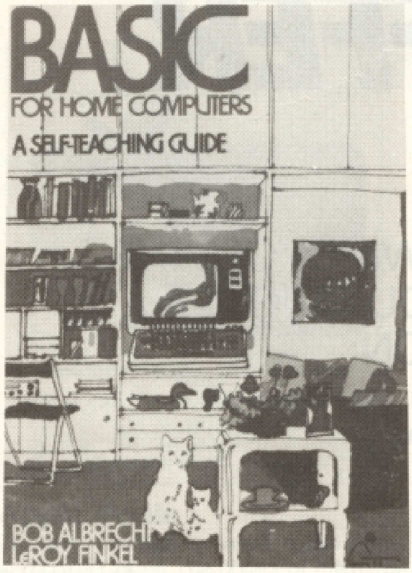
BOOK REVIEW



Back To Basics



Our book reviews this month take a look at computers and their applications from two different points of view. One for relative newcomers to computers and computing ; the other for the rather more experienced operator.

We start off with Basic For Home Computers : A Self Teaching Guide. The opening pages of the book give a brief resume of the history of Basic from its beginnings at Dartmouth College through to Micrsoft Basic, which was developed by the Microsoft Corporation, and is the version of Basic used throughout the book. If you are using a different version of Basic, there is no cause for alarm as Microsoft can easily be adapted.

We were struck at the level of 'teaching' which begins this book and we object to being taken back to the kindergarten with questions like 'what are the two parts of a video terminal called ?'. Anyone who knows what a computer looks like is advised to skip the first bit and start with the beginnings of serious programming. This is, at first, reduced to a simple level, with explanations of statements. Should you become confused at any stage there are plenty of photographs, illustrations and program listings which help to guide you through.

Questions And Answers

The material is presented in short, numbered sections which the authors, Albrecht, Finkel and Brown, call frames. Each of these frames is designed to teach something new. For instance, frame eight talks about the IF .. THEN .. GOTO statement, and frame one, in chapter eight, about doubly-subscripted variables. After each section there is a series of questions which are designed to draw the attention of the reader to specific programming points. However, there is no incentive to learning with this book as the answers are provided for you!

At the end of the book is a huge self-test questionnaire. The problems put forward here range over the complete book to test what you have actually learned. By the time you reach this stage, writing programs, understanding arrays etc. should be no problem and you will have become an experienced computer operator.

This is a compete guide to Basic, hopefully taking you from ignorance to competence. It introduces increasingly sophisticated concepts, without letting go of the relevant preliminaries.

Title:	*Basic for Home Computers : A Self Teaching Guide*
Price:	*£6.75*
Authors:	*Albrecht, Finkel & Brown*
Publisher:	*John Wiley & Sons Inc.*
Address:	*Baffins Lane, Chichester, West Sussex*
Tel:	*0243 784531*

Some Common Basic Programs

For any computer user who wants the work done for him, the book to get is Some Common Basic Programs, the text of which is practically all listings, with a couple of explanatory paragraphs before each program. Although all the programs, of which there are 76, have been tested, run, and listed, on a Commodore PET/CBM, the authors accept that there may be errors or difficulties with some of the programs, and it is in this area that they would be glad of reader feedback.

All the programs are designed to run on a 40 column PET which has at least 8K of memory, and only one of these programs is designed to be dumped out onto the printer, this one being 'Check Writer', which is not a dictionary as the name suggests, but is in actual fact a program to write cheques. Some of the programs also make use of graphics characters (such as 'Co-ordinate Plot'), and so they cannot be put straight into the CBM without the appropriate POKE commands to switch into graphic character mode. Just remember to switch back again once you've finished!

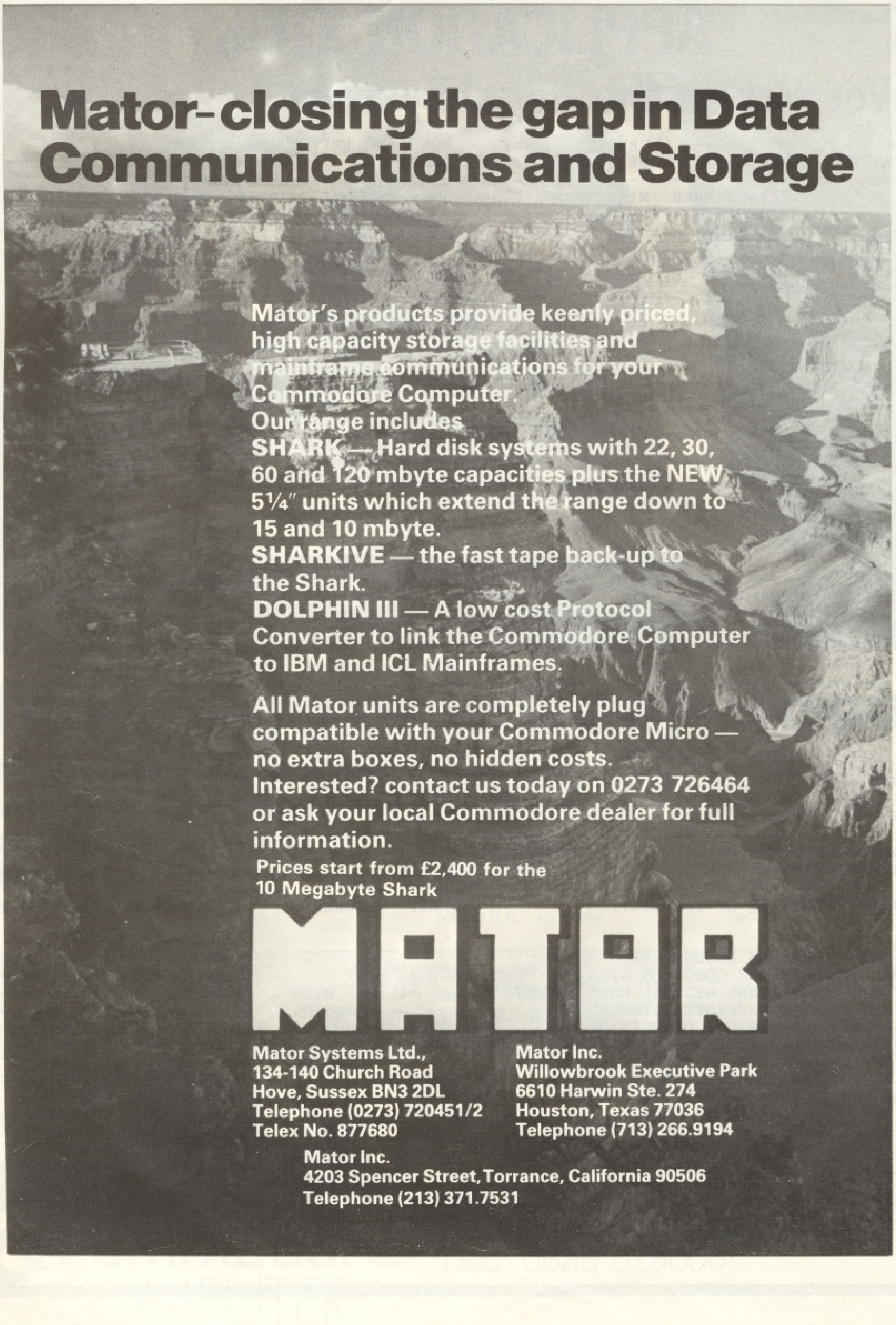
Variety of Programs

The style of the book is set with the very first program 'Future Value of an Investment', with a brief description of what the program is designed to do : mathematical equations and all. This is followed by one or two sample questions such as 'Jim Smith invests 400 pounds at a 12% rate of interest. Taking interest into account, what will his investment be worth in 1999 ?'. There then follows an actual program listing, ocasionally interrupted with REM statements to explain what the program has done, although the authors (quite rightly) say that when inputting the programs, REMs should be omittted, as they are only a waste of valuable memory.

Along with this, authors Poole, Borchers and Donahue, have thoughtfully provided a series of optional program listings. Take the example of 'Angle Conversion : Radians to Degrees', where the radian is converted so that it is expressed in degrees, minutes and seconds. What if you want it to be expressed in degrees and decimals of degrees ? The necessary program listing is essentially the same, except for the fact that blank lines occur where program changes have to be made.

Overall the book covers a variety of programs from calculating the rate of depreciation and the area of a triangle, to linear correlation coefficients and the cost of a recipe. So, a whole variety of needs are catered for in what is a very good book.

Title:	*Some Common Basic Programs*
Price:	*£10.95*
Authors:	*Poole, Borchers & Donahue*
Publisher:	*Osborne/McGraw-Hill*
Address:	*630 Bancroft Way, Berkeley, California 94710, USA*
Tel:	*Computer Bookshop, 021-707 7544*



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APPLICATION STORY

Verdict on the Legal System

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-----------------------------------------------------------------------------------
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 10.1.80    RR               50        30         25.00        25         31.25
 16.1.80    RR               30        30         15.00        25         18.75
 24.1.80    RR               45        30         22.50        25         28.13
 26.1.80    RR               20        30         10.00        25         12.50
 30.1.80    DO              120        15         30.00        50         45.00
 1.2.80     RR               35        30         17.50        25         21.88
 6.3.80     RR              180        30         90.00        25        112.50
 12.12.81   RR               25        30         12.50        25         15.63
 11.12.81   DO               20        15          5.00        50          7.50
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 TOTALS                     730                  330.00                  421.27
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'How do you plead ? Guilty or not Guilty ? Type Yes or No.' Could you imagine the Old Bailey being ruled over by a microcomputer wearing a periwig and robe ? That may look a long way off now, but in the cloistered world of the law courts things are slowly but surely moving in that direction.

The first step along that path has been taken by Dataview, who have recently announced the release of Data-Lex, an accounting and time recording program for solicitors.

Written in a combination of machine code and Basic, the system can perform two functions simultaneously. When the operator enters a transaction, the program does two things. Firstly, it displays the information, and secondly it checks the validity of the data, updating the disk in the process if necessary. Although it is necessary to press the keys to institute background processes at the time when those processes are to be performed, for the main process the operator can type in anticipation of the event, since the computer stores the message until it is to be used. Combined with two other Dataview packages, namely Wordcraft and The Executive, the microcomputer can be used for practically all the solicitors administrative work. The addition of Wordcraft means that a complete A4 document can be shown on the screen, with the disk unit storing documents of up to 255 pages. Wordcraft can connect eight Commodore machines to the same disk drive and printer.

The whole system keeps eight different journals and produces three reports. The program keeps a record of bank accounts, one for the solicitor and one for his client showing debit, credit and balance. Any account opened for the client has two parts, one being monetary and the other being time costing. This latter tells the practise how much it has cost to do the work for the client, and is shown at the same time as

```
DATA-LEX
REECE & CO                          C L I E N T   B A N K   A C C O U N T

DATE     DETAILS OF TRANSACTION            DEBIT      CREDIT       BALANCE  CAT ACCNT NO


         BALANCE BROUGHT FWD                                       NIL
3.2.80   A.SUNDER COSTS ON A/C            300.00                  300.00 DR  DIV 80-190-1
3.2.80   REGISTRAR GENERAL MARRIAGE CT                  8.50      291.50 DR  DIV 80-190-1
10.2.80 H.M. PAYMASTER GENERAL                         35.00      256.50 DR  DIV 80-190-1
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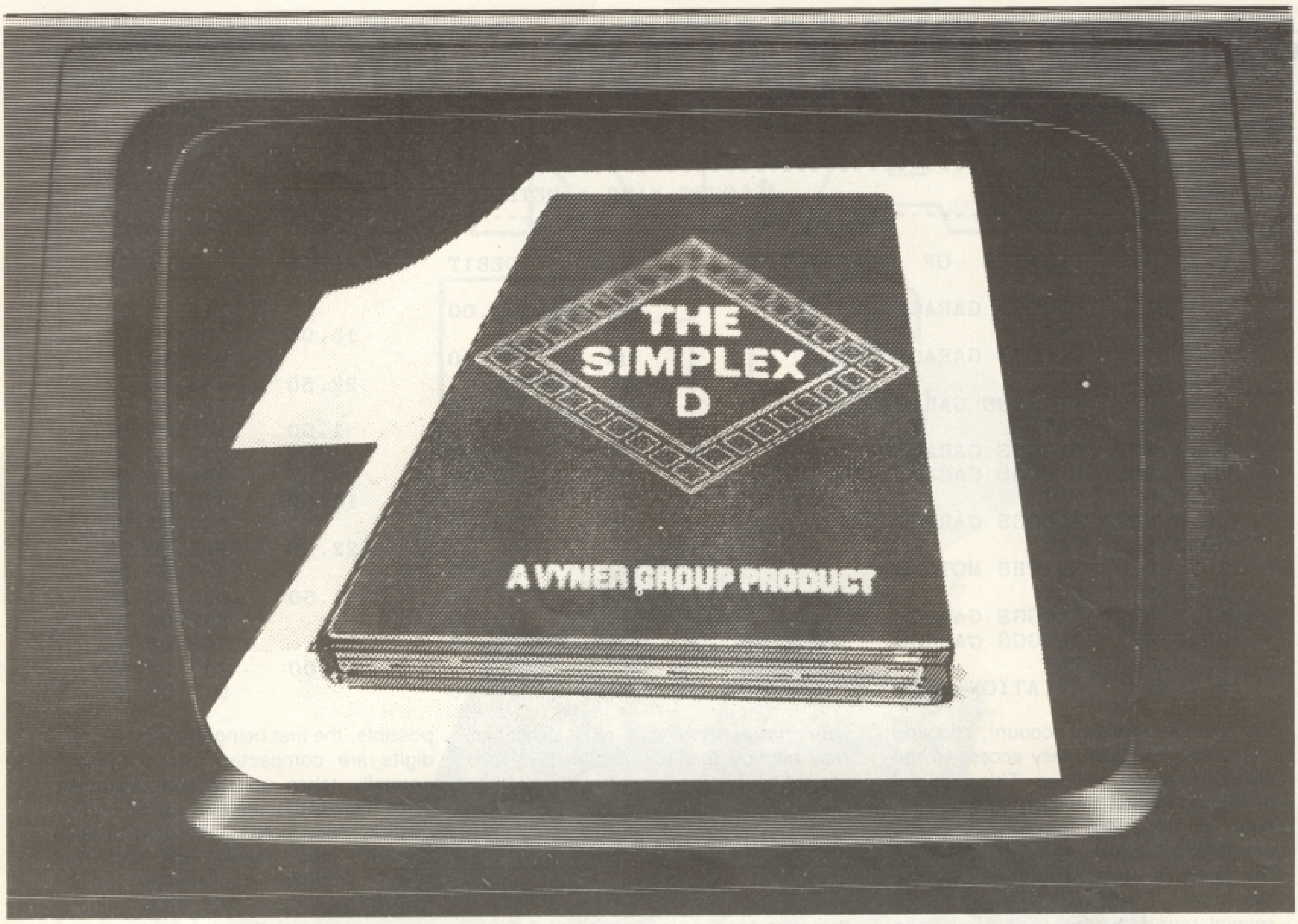

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  - (b) Lists of unpaid bills
  - (c) Simple profit and loss accounts

MICRO-SIMPLEX

MICRO-SIMPLEX

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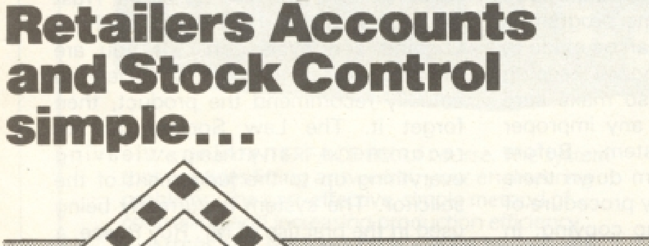

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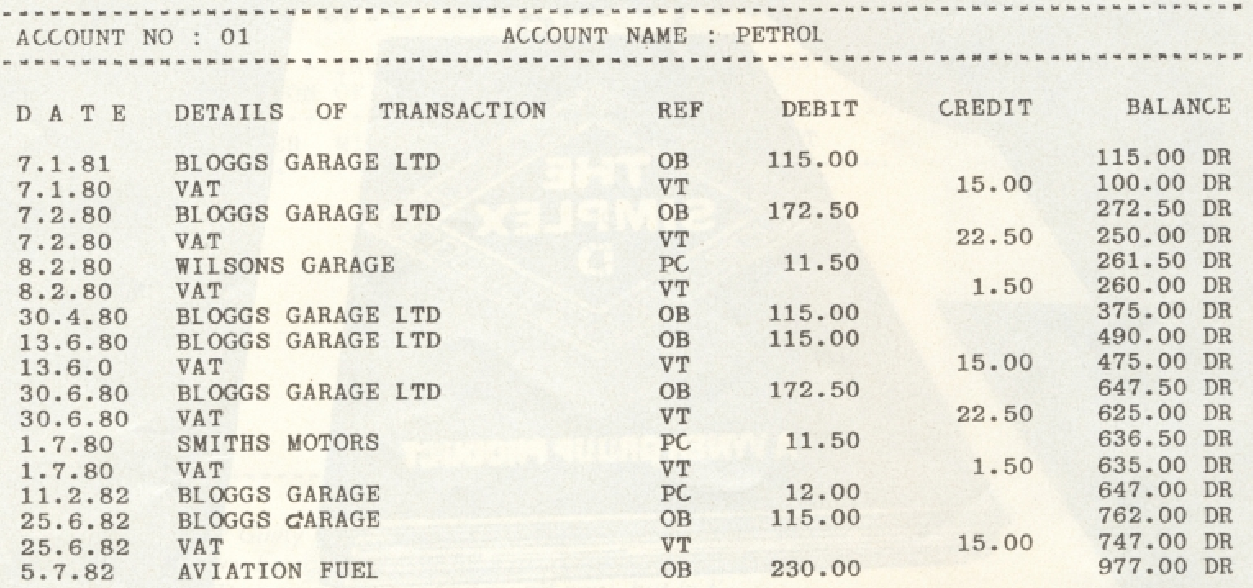
COMPUTER



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-----------------------------------------------------------------------------------------
ACCOUNT NO : 01                        ACCOUNT NAME : PETROL
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D A T E    DETAILS  OF  TRANSACTION         REF      DEBIT        CREDIT       BALANCE

7.1.81     BLOGGS GARAGE LTD                OB      115.00                   115.00 DR
7.1.80     VAT                              VT                    15.00      100.00 DR
7.2.80     BLOGGS GARAGE LTD                OB      172.50                   272.50 DR
7.2.80     VAT                              VT                    22.50      250.00 DR
8.2.80     WILSONS GARAGE                   PC       11.50                   261.50 DR
8.2.80     VAT                              VT                     1.50      260.00 DR
30.4.80    BLOGGS GARAGE LTD                OB      115.00                   375.00 DR
13.6.80    BLOGGS GARAGE LTD                OB      115.00                   490.00 DR
13.6.0     VAT                              VT                    15.00      475.00 DR
30.6.80    BLOGGS GARAGE LTD                OB      172.50                   647.50 DR
30.6.80    VAT                              VT                    22.50      625.00 DR
1.7.80     SMITHS MOTORS                    PC       11.50                   636.50 DR
1.7.80     VAT                              VT                     1.50      635.00 DR
11.2.82    BLOGGS GARAGE                    PC       12.00                   647.00 DR
25.6.82    BLOGGS GARAGE                    OB      115.00                   762.00 DR
25.6.82    VAT                              VT                    15.00      747.00 DR
5.7.82     AVIATION FUEL                    OB      230.00                   977.00 DR
```

the client's monetary account, enabling the solicitor to gain easy access to the client's financial position. This is useful in litigation when the client is chasing a debt of, say, 400 pounds, and the solicitors bill comes to 500 pounds, as the client can then be advised to drop the action. The time costing is one of several reports to be printed out, the others include listing of individual client balances (which lists 200 in ten minutes), and the sum of work for the practise or category of works. The category codes relate to the different types of work undertaken, and there is enough space for 64 of these codes, so long as they are three characters long.

Along with the Office Bank Account and the Petty Cash Account, Dataview have also made provision for a Trustee Bank Account, because English Law permits the existence of the Solicitor Trustee. In such an account the money must be kept seperate from the clients ordinary account. When a client has a designated Deposit Account, entries relating to that account are displayed in the Client Account columns since they relate to money which belongs to the client. The operation of the Deposit Account is similar to that of the ordinary and client accounts, the information being taken from a source material like a bank credit slip. If a client wishes to transfer money from one account to another, then two entries have to be made i.e. a credit and debit in the appropriate ledger cards with the corresponding equal and opposite double entry on the bank sheet being made automatically by the system.

After opening the system, there comes a barrage of messages making sure that everything is okay. The first may tell you that the disk in drive zero should be in drive one, should you have put them in incorrectly, and if you are unlucky you will be told that the drives are non-compatible or that the security key is not in properly. There is also a warning contained in the program which tells if an account is in debt and if this is so then the warning can not be overridden. The Datalex mastercopy has a facility enabling the practise to set up an accounting system with its own passwords, work codes, rates etc. However, the facility can only be used once because after the parameters have been set up, access to the program is impossible, but changes can be made to the program using the house keeping section. These checks also make sure that there has not been any improper closedown of the system. Before anybody closes the system down there is a recommended security procedure of audit printing and back-up copying. In the audit printing part of the process, the disk unit scans and passes the information into the VDU and the printer, the information being printed as many times as you like. With regards to the backup, 3 sets of disks are recommended, so that there will always be one disk up to date in the event of others being destroyed.

An account can be found using either the account number or the name of the client but, although the account number can be used as a case reference number, the typists reference number can not be used to find the account. There are several programming techniques used that allow the maximum number of accounts to be kept on as little space as possible, the first being the fact that two digits are compacted into the space normally taken up by one character. Then there is the fact that a fixed portion of disk space is NOT allocated to each account, and, finally, the fact that several frequent transactions can be reduced to a single letter. Information to be erased from the disk can only be cleared when the data in question has been printed out as a security precaution.

The system complies with a set of rules laid down by the council of the Law Society : the Solicitors Account Rules of 1975 and the Solicitors Trust Account Rules of 1975 which apply to England and Wales only. If you are thinking of asking the law society to actually recommend the product, then forget it. The Law Society do not recommend anything, leaving everything up to the judgement of the solicitor. The system is currently being used in the practise of Mr. Roy Reece, a solicitor of the Supreme Court, under whose supervision the program was actually written. It runs on the 8032 and 8096 with the 8050 floppy disk unit, but othe the units with a larger storage capacity can be used as long as they are approved by Commodore. The printer can either be a daisywheel or dot matrix as long as it prints 132 characters per line.

Although there are quite a few accounting systems that could be adapted to be used by a solicitors practise, this one looks like good value. Verdict : Come on Dataview, bring on your next witness!

Martin Bush

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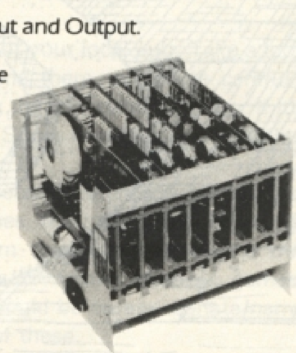

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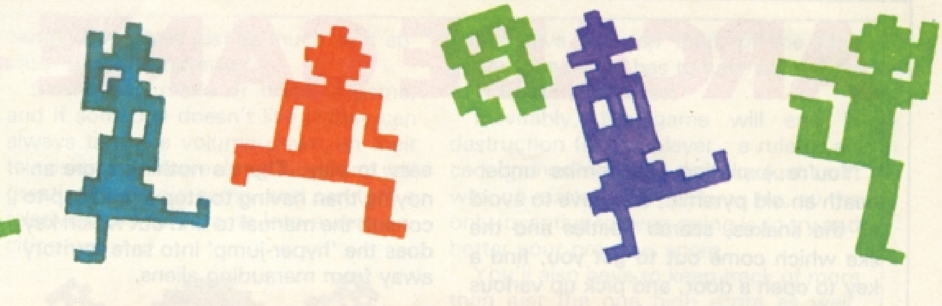
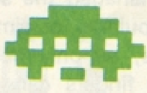


HOW TO WRITE A TOP SELLING ARCADE GAME



You have got to admire companies like Imagine, Quicksilva, and Romik for one thing : They have all succeeded in producing top class arcade games for home microcomputers, and in the process managed to amass a vast amount of money! If you're new to computing, or even if you're an experienced programmer, you've probably been daunted by the idea of sitting down yourself and writing such a game. Too complex, too much to think about, and besides it would take far too long to write. This month, Commodore Computing takes a look at the world of arcade games, and how to go about writing one yourself. You, too, could be a millionaire by Christmas!

Getting Started

They say that imitation is the sincerest form of flattery, and it is true that some of the top selling games are copies of well known pub arcade games : Space Invaders and Asteroid-type games seem to predominate here. However, the market for that sort of thing is strictly limited : people aren't going to buy ten different copies of the same game : and so the most important thing in writing your own game is to come up with a scenario that is new, and that will stand up to repeated playing.

And the best place to start ? Probably in the bar of your local pub. Take a look at the game there, and note carefully everything that the game is doing. If it's a game of Space Invaders, go to another pub!

We've recently seen a number of arcade games that are intriguingly different from the usual run of the mill 'shoot em down and destroy' games. Genghis would be an appropriate name for most of these.

To give just one example, a game called Tutenkhamen, a mixture of traditional death and destruction with just a touch of Adventure playing thrown in.

ARCADE GAME

You're exploring the tombs underneath an old pyramid, and have to avoid all the snakes, scarab beetles and the like which come out to get you, find a key to open a door, and pick up various treasures en route. Only by getting the key can you progress to the next level, and on you go.

This is another secret of the more popular games: a number of different levels of play, whether they're simply faster versions of the first level, or completely new and different scenarios. This is a point to bear in mind when thinking of your own initial ideas: can the game progress from the humble beginnings that you've given it ?

So, you have to think of the scenario, and make it good, different, and have the possibility of extending the game by moving onto different levels when you've zapped the relevant number of invaders, collected the right number of treasures, or whatever.

Secondly, you don't want to make it so difficult to play that people quickly become bored, and move on to other games. Defender is a classic example here: a very good piece of programming, but it's never managed the same kind of universal popularity of simpler games like Asteroids, as only people with very dexterous fingers can ever achieve good scores.

Keep it simple, must be the rule, and don't have people hunting all over the keyboard to find the right key in moments of panic. Perhaps make it playable by joystick, but always make sure that it will work on the basic machine. For example, the Vic 20 comes with only 3.5K of RAM (but it's 3.5K better than nothing), and no joystick. Although many people will buy extra memory, and also buy a joystick, not all of them will, so by writing a game that requires those features you're immediately cutting down your potential audience.

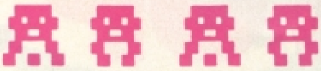
Stick to the basic machine, but give people the option of using joysticks if that is going to make the game easier to play. Above all, avoid the 'fingers like wet spaghetti' syndrome, as you frantically press the wrong keys!

To sum up so far : think of the idea, keep it simple but with the possibilities of expansion into further and more interesting levels of play, make it as addictive as possible (easy really, as most simple-to-play games have the right kind of addictive qualities), and make sure it's easy to play. There's nothing more annoying than having to stop in mid-zap to consult the manual to find out which key does the 'hyper-jump' into safe territory away from marauding aliens.

Defining Characters

Having got the idea down on paper, we now have to get it down on the screen as well!

Assuming that we are setting out to write some kind of space game, take a look at the real arcade games and decide for yourself why it is that some are more popular than others. We've looked at some of the reasons already, but there's a lot more that goes into making a successful and long lasting game.



As ever, it's the little touches that help. We'll look at sound later on, a vital factor in games playing (and at least televisions have got a volume control if the sound distracts you), but for now we'll just concentrate on the screen display.

In a space game, a nice touch is to have a perpetually changing starry background. With bit mapping of the screen, it's not too difficult to achieve this, and this in its turn achieves something else. It obeys the golden rule of graphics on the screen : always keep it moving, and always keep it changing. Stars that wink off and on, that change colour, help to keep the game addictive.

Obviously the most important piece of design work are the major characters in the game : the spaceship (or laser gun, or whatever you decide to call it), and the enemy.

There are a number of screen utilities that exist for each particular computer, and with most of the ideas given here you'll find a suitable program listing at the end of the article.

All these listings perform various important functions in an arcade game, and can be used to form the skeleton for a game of your own.

Most programs use very similar routines time and time again, and writing arcade games is no exception. Once you've written one, the rest follow on very easily : like everything else, the first time is really the most difficult, and also the longest.

So, how to define a character. You could have a boring old spaceship, but with the graphic capabilites of the computer that you've got, it would be a great shame if a good idea were to fail at this stage.

Come up with a good design, that is not merely a copy of someone else's. You don't need to go so far as to have a mole or something spitting out venemous lasers and destroying everything in sight, but it would make sense to have something that is slightly different from the usual run of the mill spaceship.

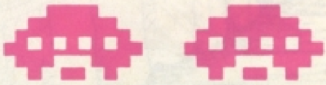
Take great care over its design, because it's going to be the one thing that remains on the screen all of the time, and is thus the item that the peron playing the game will have fixed in their mind. If it's boring to look at, they'll rapidly forget the game after a few minutes away from it, but if it looks good, and original, it will remain in the mind and you'll be on your way to fame and fortune. People remember bad ideas, just as much as they remember good ones, and it's a lot harder to succeed after an initial failure, so get it right first time!

Okay, you've designed your spaceship, you've thought about the background display, what are our aliens going to look like ?

Alien Design

Here again it's well worth going to have a look at some of the more successful pub games, and the shape and form that the aliens take in those. Cosmic Firebird is one very good example, where it is obvious that a lot of thought has gone into alien design : the characters look good, and you remember them months after playing the game.

A form currently in vogue is that of the flying bird, and a number of games are now using those as the alien. I'm not suggesting you copy those, but at least give yourself some idea of what everyone else is using : remember the competition will be watching you as much as you're watching them.



Decide what those aliens will do. Will they split up as they come down the screen ? Will they have to be shot once, twice, three times or more before joining that great invader Graveyard in the sky ? Will they home in on the avenging spaceship, or just impersonate lemmings as they wander down the screen ? If they go off one side of the screen will they re-appear on the other, or will they emerge at the top of the screen again ?

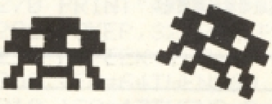
Sort out all these things in your mind, and write the alien handling routines accordingly. No-one is going to like a game where movement of the various objects on the screen follows different rules from time to time. If they disappear off the left hand side of the screen and then re-appear on the right, that is what they will do throughout the game.

Will you have more than one sort of alien ? In the vast majority of the popular games there are many types of enemy, and so you too must resign yourself to the fact that you'll be designing more than one alien. We've reproduced some possible designs here, to give you some ideas, but the real work will have to be done by you. We'll help, but we won't write the program for you!

Character Movement

Your spaceship must also adhere to the rules of movement, and this will be one of the most difficult parts of the program to write. Not only do the images on the screen have to be moved, but you also have to keep track of where they've moved to. How else will you know whether an alien has been shot or not, if you don't know where it's moved to ? With the Commodore 64 this sort of thing is rather easy, as we have routines to look after character collision, provided we've designed everything in sprite form. Sprites may not solve your design and movement problems, but they do make life easier.

When characters collide, will something happen to them, or will they just sail serenely past each other ? Again, you'll have to decide on that one.



Whatever they do, always keep something on the move. We've said it earlier, but it really is the most important part in the world of computer animation:always keep something on the screen, and always keep something happening. You want to keep the attention of the player, not send him off to sleep!

Right, we have now decided on our scenario, we've designed our characters, both friendly and unfriendly, and we've decided how they're going to move about the screen, and the rules that they will obey in that movement. So, we can now sit down and write the game, can't we ?

Unfortunately the answer is no! We've done the bulk of the program design, but there's an awful lot more yet that has to be done before the game is a sure-fire winner.

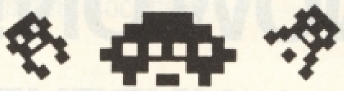
Just think back to all the popular arcade games, and think what they have in common. As well as superb graphics and animation, sure screen movement and alien handling, easy manipulation of the destroying spaceship, there is something else that they have which we have not yet considered.

What are we looking for ? The answer is that we're not looking for anything, we're listening for it!

Zap - Pow - Kaboom!!

The hills are alive with the sound of music, as they say, and this applies to beady little aliens just as much as it applies to Julie Andrews.

Sound can make or break a game, and if someone doesn't like it they can always turn the volume down on their television set. However, good sound will greatly enhance a game, and can turn a relatively ordinary game into a very exciting one.



Remember the original Space Invaders, which exploited sound with great success. Their great trick was to reproduce the human heartbeat, and have that zapped up as the game progressed, and thus as it got faster and faster so your reactions seemed to speed up and, at the end of a long game, you were considerably exhausted.

Without sound this would probably not been the cause, and was a major factor in making Space Invaders as popular and enduring as it was.

Apply sound to all your games, but make sure that the sound is an addition to the game, not a detraction.

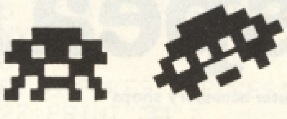
When you destroy an alien, respond with a satisfying death cry. When your spaceship is zapped into smithereens, and again you must decide how that happens, respond with sounds of cosmic proportions, as befits the doom of a space hero!

Asteroids, like Space Invaders, was another game to feature a continually running sound, and any game that is to make its mark on a crowded market must do the same as well. It must not be a noise that irritates, like a high pitched whine, but it must create some kind of response in the user other than making him/her immediately reach for the volume control.

High Scoring

From sound, we come to the question of keeping score. You must decide how many points are gained by each destruction of an alien, and whether all aliens merit the same number of points.

Most people seem to favour high scoring games rather than low scoring ones, so although zapping 10 aliens can give you a score of anything from 10 points to 10 thousand points, there is far more satisfaction to be gained from scoring 10 thousand than there is from scoring 10.



Is there going to be some kind of time limit to your game, such as fuel running out or something of that nature ? In a case like that, points can be gained by refuelling, for instance.

However you ultimately decide what points are to be allocated, you will certainly have to keep track of the high score : the player has to have some kind of a target to aim for!

Inevitably, the game will end in destruction for the player : a rule of arcade games has to be that you just can't win, no matter how hard you try, so the only incentive to keep going is to try and better your previous score.

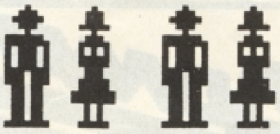
You'll also have to keep track of more than just the one high score as well. Some games go overboard on this, and feature anything up to 150 scores, but 10 is usually sufficient. Perhaps room to enter the player's name as well ? We've all got a streak of vanity in us!

Conclusion

We've tried to cover every aspect of writing a top selling arcade game : designing characters, moving them, sound, high scores, graphics, and the all important factors of getting the idea in the first place.

Given the rules that we've outlined above, it should now be possible for you to sit down and write your own game, and not have to keep forking out 20 pence into a machine all the time, or spending pounds and pounds on other peoples' software.

All of the top selling companies, such as the ones we mentioned at the start of the article, are always on the lookout for new and exciting arcade software, that is both original and well-written, so a possible outlet for your talents would be through one of those companies.



You might like to try marketing the program yourself, but that is a path littered with dangers and pitfalls, and many an unwary operator has found himself to be the victim of the taxman before now!

So on the whole it is better to stick to an established company who knows what it is doing.

The rest of this article features listings that explore in more detail some of the ideas we've mentioned earlier.

You are welcome to take these routines and incorporate them into your own programs. None of them are compete programs in their own right, but they do all perform some of the commonly encountered functions required in the writing of an arcade game.

As usual in computing, there is no sense to be had in continually re-inventing the wheel, so make use of the listings that we've given you here. By all means re-write them to fit your own particular requirements, but they should all be of use in one particular type of game or another.

We look forward to seeing your programs in the next series of glossy advertisements in this magazine!

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ARCADE GAME

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10 V=36878:S=36877:S1=36876:S2=36875:S3=36874:L=3:HI=100
20 PRINT"▌▒▒▒▒▒▒▒▒▒▒▒▒▒           ▩DODGEM DOCKER▦"
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40 POKE7168+I,PEEK(32768+I)
50 NEXT
60 FORI=1TO4
70 READX
80 FORJ=0TO7
90 READK
100 POKEX+J,K
110 NEXT:NEXT
120 POKE36869,255
130 DATA7632,112,8,36,95,95,36,8,112
140 DATA7640,0,128,192,252,255,248,0,0
150 DATA7648,126,255,255,255,255,255,255,126
160 DATA7664,60,66,165,153,153,165,66,60
170 POKE36879,10
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190 READA1:IFA1<>-1THENPOKEAD,A1:AD=AD+1:GOTO190
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390 H=HAND(H<>32)
400 IFH=60THENPOKEV,15:POKES,128:X=P+7:SC=SC+1:GOTO430
410 IFH=62THEN550
420 POKEX,32
430 NEXT:POKEV,0:POKES,0
440 CL=PEEK(P)=62ORPEEK(P+1)=62
450 IFCLTHENSC=SC+100:POKEV,15:POKES1,233:POKEES2,245:GOSUB660:POKEV,0:POKES,0:P
OKES1,0:POKES2,0:GOTO210
460 IFPEEK(P+1)=60ORPEEK(P)=60THEN550
470 POKEP,58:POKEP+1,59
480 POKEP+D,2:POKEP+D+1,1
490 GOTO260
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510 FORI=0TO25
520 POKE(P1+INT(RND(1)*5-2)*22+INT(RND(1)*5-2)AND8191)OR7680,60
530 NEXT
540 RETURN
550 L=L-1:POKEP+1,42:FORXX=15 TO 0 STEP -1:POKEV,XX:POKES,255:POKE7701,L+48
560 FOR ZZ=1 TO 100:NEXT ZZ,XX
570 IFL=0THENIFSC>HITHENHI=SC
580 IFL<>0THENPOKEP+1,32:POKEV,0:POKES,0:POKES1,0:POKES2,0:GOTO210
590 POKE36869,240:POKE36879,27:PRINT"▌▤";
600 IFSC=HITHENPRINT"WELL DONE GREAT SCORE":POKEV,0
610 PRINT"▩▩ ANOTHER GO (Y/N)"
620 GETA$:IFA$<>"Y"ANDA$<>"N"THEN620
630 IFA$="Y"THENSC=0:DI=0:GOTO30
640 PRINT"▌  GOODBYE NOW!!"
650 END
```

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ARCADE GAME

The game included is an elementary example of how to start putting an arcade game together. The object of the game is to avoid collision with the asteroid type objects and to shoot as many as possible. If you manage to dock with the station (an encircled cross) then you add 100 to your score and move up a level. If you shoot the station you lose a life.
The game keeps a high score throughout. The controls are as follows:

A = UP   Z = DOWN   = LEFT   = RIGHT   SPACE = FIRE

Now for a brief rundown of the workings of the program. Line 10 sets up V, S, S1, S2 and S3 as the Volume and the voices for sound. Also on line 10 L is set to 3 (three lives) and HI is set to 100 (hi score). Line 20 prints the title. There will be a short pause while the new characters are read in. Line 30 resets the data and the number of lives between games.
Lines 40 — 110 read and poke into memory the new characters. Line 120 switches to new characters and lines 130 — 160 contain the data for the characters. Line 170 changes the colour of the screen (black). In line 180 AD is set to the starting location of the machine code program. Line 190 reads the machine code data poke's it into memory incrementing after each read and only stops when it reads a − 1.
Line 200 sets SC (the score) to 0 and D to the difference between the screen and the colour RAM. In line 210 the screen is cleared and the starting position of the spacecraft is initialized. On lines 220 — 240 are a loop to put yellow into the colour ram (therefore asteroids appear in yellow). Line 250, DI is the difficulty level, it increases after a collision or a docking and the two gosub statements jump to the routine to place the asteroids and the station on the screen.
Lines 260 — 270 put up the score and the number of lives left. Line 280 deletes the spacecraft and replaces it with the background colour, as the screen is continuously scrolled by the Machine code routine. Lines 290 - 340 check for a correct key press and then move in the direction indicated. Line 350 checks to see the spacecraft is on the screen, if not then it puts it back on the screen.
Line 360 calls the machine code routine that was poked into memory at the start of the program. There is a listing of the machine code routine included, for those interested, but it is not needed. On line 370 Q is set to ignore the space bar on alternative passes, thus making the game a little harder by reducing the firing rate, also A checks for the fire routine. Lines 380 - 430 are the fire and hit routines also the docking routine.
On line 440 CL is set to equal a successful docking and line 450 adjusts the score and moves up a level. Line 460 checks for a collision with asteroid. Line 470 puts the spacecraft on the screen. Line 480 puts in the colour of the spacecraft. Line 490 jumps back to update the score line. Lines 500 — 540 initialize and place the asteroids on the screen. Lines 550 — 570 is the crash routine also decreases the number of lives left and checks for no lives left. On line 580 if the player still has a life left the game continues, after setting the voices and the volume to 0.
On line 590 the program returns to normal character generator. Line 600 looks for new high score, if there is a new high score prints encouraging message!!! Lines 610 — 640 contain the exit game or play again routine. Line 650 ends the game. Line 660 is a delay loop for sound effects. Lines 660 — 820 contain the data for the machine code screen scrolling routine. The dissassembled listing of the routine starts at Hex $033c Dec 828, and scrolls 22 lines of the screen from right to left one character position each time it is called. The line it does not scroll is the top line which has the score, the hi score, the starting position of the spacecraft, and the number of lives left.

```
660 FORP=1TO500:NEXT:RETURN
670 DATA169,22,162
680 DATA22,133,87
690 DATA169,30,133
700 DATA88,160,0
710 DATA177,87,133
720 DATA89,200,177
730 DATA87,136,145
740 DATA87,200,152
750 DATA201,21,208
760 DATA244,165,89
770 DATA145,87,165
780 DATA87,24,105
790 DATA22,133,87
800 DATA144,2,230
810 DATA88,202,208
820 DATA220,96,-1
READY.

., 033C LDA #$16
., 033E LDX #$16
., 0340 STA $57
., 0342 LDA #$1E
., 0344 STA $58
., 0346 LDY #$00
., 0348 LDA ($57),Y
., 034A STA $59
., 034C INY
., 034D LDA ($57),Y
., 034F DEY
., 0350 STA ($57),Y
., 0352 INY
., 0353 TYA
., 0354 CMP #$15
., 0356 BNE $034C
., 0358 LDA $59
., 035A STA ($57),Y
., 035C LDA $57
., 035E CLC
., 035F ADC #$16
., 0361 STA $57
., 0363 BCC $0367
., 0365 INC $58
., 0367 DEX
., 0368 BNE $0346
., 036A RTS
```

A look at cassette security and management

Software protection is a relative term for there is practically no software that can be completely protected. All that can be reasonably done is to make programs 95% secure so it takes considerable effort to 'crack the code'.

Routines have been published in the past for the protection of disk-based software, but cassette based protection routines have not been well publicised. Many software houses do not feel it really worth the effort of protecting software or are resigned to the fact that it will probably be copied in any case by fair means or foul.

What should software protection seek to achieve? In designing this set of software routines I had in mind two principle objectives i.e. that whilst the program should run as normal it should not be possible to LIST or SAVE in the normal way and that the routine should be easy to append to a program that one wished to protect.

To prevent programs being SAVEd is relatively easy. Machine code which is essential to the unscrambling and running of the major program is located in the first cassette buffer—when a 'normal' SAVE is attempted then the machine code is overwritten and the 'key' to the scrambled program 'thrown away'. This procedure is followed here and as an additional precaution the IRQ interrupt which is diverted to perform a RUN-STOP key disable is left diverted after a program run thus making a SAVE even more difficult.

In the case of LIST the procedure is slightly more difficult. Three principle methods have been used and these are:

(i) Making BASIC start in a slightly different place so that the routine which scans the program is fooled by zero bytes into thinking that there is no program in place

(ii) The RUN-STOP is disabled so the program cannot be halted for listing. This is done in a way that does NOT bypass the clock up-date so this can still be used for timing purposes. Whilst BASIC II measures in 60 'jiffies' to the second, BASIC IV measures 50 'jiffies' with a software patch to speed this up to 60. In the case of the routine published here, the software patch is also disabled so that users will need to remember to divide by 50 'jiffies' rather than the more customary 60 if they are using BASIC IV

(iii) There are certain characters which can prevent listing. These are used to CORRUPT a program by occupying the places normally occupied by the end-of-line 0's making unscrambling rather difficult.

```
AUTORUN HEX DUMP
 C*
      PC  IRQ  SR AC XR YR SP
. ;  B780 E455 2C 34 3A 9D F6
.
. :  0312 A5 AE F0 11 20 F8 F3 AD
. :  031A 7D 02 85 2A AD 7E 02 85
. :  0322 2B 85 A2 D0 07 A5 A2 D0
. :  032A 03 6C FC FF A9 00 85 A2
. :  0332 F0 03 EA EA EA 4C 9C 02
.
.
 READY.
```

In general terms, one wishes to avoid a situation when the program is running normally which would result in a 'crash' into direct mode. In a case like this e.g. a DIVISION BY ZERO error it would be possible to list the program so the author needs to be especially careful that all critical points in the program and particularly INPUT statements are protected in some way. INPUT statements can generally be protected by placing three shifted spaces and three cursor lefts after the INPUT message but there are several other ways (e.g. POKING 14,1 (Basic II) or 16,1 (Basic IV)) Alternatively opening a file to the keyboard with OPEN 1,0 and thereafter using INPUT 1,XS is preferred by many people.

In addition, this protection package checks to see if any TOOL-KITS or other add-ons are altering CHRGET and if so resets the machine. This is because these routines can be used on occasions to break into the monitor from whence one could get the program itself. Another device ensures that when a cassette program is saved to disk and then run, the machine will be reset.

As already mentioned the machine code fits into the WHOLE of the first cassette buffer. This leaves the whole of the second cassette buffer free so one can still use DISK commands and also the locations from 897 — 1000 decimal for machine code programs in BASIC IV. The protected program will not respond to a RUN or a LIST upon loading but performs the following functions:

Checks for a pass-word key to be pressed. One try only is used and the machine resets itself if you get it wrong! This is a refinement and can be bypassed if it is irksome. On the other hand it does add yet another layer of protection!

The routine tests to see if the machine is BASIC IV/II. The 'default' is written in BASIC IV but if BASIC II ROMs are identified then the routine will alter all of the specialised calls to ROM routines so that the program will run perfectly well on BASIC IV or BASIC II machines. (More exactly a program saved on a BASIC IV machine will run on BASIC IV or BASIC II but a program *saved* on a BASIC II machine will only run on BASIC II. The changes are, however, easy to make and will be detailed later.)

As already mentioned, special routines reset the machine under certain circumstances and disable the RUN-STOP key.

The program is 'restored', the start of BASIC altered and then RUN.

The protected program uses a SYS call as its very last statement (and it is the responsibility of the author to make the program exit only through one point and that at the physical end

```
BASIC IV + AUTORUN HEX DUMP
C*
   PC  IRQ  SR AC XR YR SP
.; B780 E455 2C 34 3A 9D F6
.
.: 028F 20 EA FF A9 FF 85 9B 4C
.: 0297 58 E4 6C FC FF A5 70 C9
.: 029F E6 D0 F7 A5 79 C9 C9 D0
.: 02A7 F1 A5 D4 C9 01 D0 EB 20
.: 02AF C0 FC 78 A9 8F 85 90 A9
.: 02B7 02 85 91 58 A9 13 85 28
.: 02BF 20 C5 02 4C E9 B5 A2 13
.: 02C7 86 1F A0 04 84 20 A0 00
.: 02CF B1 1F 85 01 48 C8 B1 1F
.: 02D7 85 02 85 20 68 85 1F D0
.: 02DF 02 C6 02 C6 01 88 A9 00
.: 02E7 91 01 A6 20 E4 2B D0 DE
.: 02EF 60 A9 01 85 28 85 D4 A9
.: 02F7 DB 8D E6 02 20 C5 02 A9
.: 02FF 00 8D E6 02 60 A9 20 20
.: 0307 D2 FF 20 E4 FF D0 FB C9
.: 030F AB F0 87 A5 AE F0 11 20
.: 0317 F8 F3 AD 7D 02 85 2A AD
.: 031F 7E 02 85 2B 85 A2 D0 07
.: 0327 A5 A2 D0 03 6C FC FF A9
.: 032F 00 85 A2 F0 03 EA EA EA
.: 0337 4C 9C 02 FF 00 FF 00 FF
.
.
READY.
```

of the program!) This routine alters the start of BASIC to inhibit RUN and LIST and also 'corrupts' the program so it will always be saved in a 'corrupted' state.

Saving Your Programs

It is easy to Append the protection routines onto a program you wish to protect. With the program to protect already in memory then make line 1 a REM with *exactly* twelve asterisks (leaving no space between the REM and the symbol used). Make the physical and logical last line 'SYS 752:END'. Then load the machine code into the first cassette buffer by positioning your 'PROTECTION' tape in the cassette unit and typing OPEN1. This will have the effect of loading in the header containing the name of the program but *also* the machine code which has been saved along with the name! Finally, POKE 1025 with 0 and 1026 with 0. You make poke 0 into every location from 1025 up to and including 1041 if you wish, perhaps by using a loop such as : FOR J = 1025 TO 1041:POKE J,0 :NEXT. When you now run the program by a call to SYS772 then the program will start to run and on completion will not respond to RUN or LIST but only to another SYS772 call.

When you first run the program you will see a question mark appear at the next available screen location. Be warned: a machine code GET is in operation and a wrong move will reset the machine! The correct key(s) to press are SHIFT (keep it held down!) and then the + key (i.e. plus key above the = key). This will now access the program if all has gone well so far. If you wish to change the pass-key then poke the relevant ASCII code into place after a program run by POKING 783 with ASC("@") where @ is the character that you wish to use. If you find this all a little irksome to use, then POKE 780,208: POKE784,240 will ensure a 'normal' entry. To reinstate the pass-key then POKE 780,240:POKE784,208.

Having got our program protected, the next thing to do is to save it in a protected form. Having protected a program and run it at least once then it can be saved in the following way:

Ensure that the IRQ vector points in the right place by making a SYS call to SYS 64704 (BASIC IV) or SYS 64635 (BASIC II).

Allocate a name to your program by making a string *exactly* 16 characters long and allocating to a variable such as NS (you may like to incorporate the SYS772 into the end of the name as I have done so that you do not forget it).

Put the machine code into a string with the following statement:

AS = : FOR J = 0TO170:AS = AS + CHRS(PEEK(655 + J)):NEXTJ

Now cancatenate the strings with PS = NS + AS (you may like to check that the string is 187 characters long. If not or you get any OUT OF MEMORY errors then CLR and repeat the process).

Finally, SAVE PS (That's all). Do not be alarmed at graphics characters appearing all over the screen as soon as you press PLAY + RECORD : this is machine code in the extended header being 'written' but it should not reappear when your program is loaded back again.

In this rather ingenious way you will have saved a program with a first cassette buffer full of data and you can then use your program as a 'protected' program or indeed just use the 'machine code' part of it by loading in with the OPEN1 command. Remember, in this case, that only the first cassette buffer will load and not the rest of your 'PROTECT' program so you will not harm a program already resident in main memory.

Enhanced Security

There are two further refinements you may wish to incorporate. If you study the BASIC program listing then you will see that in lines 2-6 there is a 'mimicking' of the direct mode. The screen will clear and the word READY appear complete with flashing cursor. RUN will obviously run the program but as the listing ought to be free from prying eyes you can put whatever string you like at this point to enhance security still further. You can see the fate of would-be listers in line 4 where the SYS call is a call to reset the whole machine. Any statement other than RUN or LIST merely clears the screen and reinstates the READY. statement. The construction here is to regard the keyboard as a logical file which has the effect of suppressing a question mark after the INPUT 1 statement. It would be possible to contanenate a string using GET 1 statements and this will obviate the need for a press of the RETURN key.

The last refinement is the incorporation of an AUTO-RUN so that the program is even more secure from listing. In this latter case, however, we are running short of space in the first cassette buffer as every available location was in use.

	BYTE	BASIC IV	BASIC II
1.	0297	58	31
2.	0298	E4	E6
3.	02AF	C0	7B
4.	02C3	E9	72
5.	02C4	B5	C5
6.	02F7	DB	CC

CASSETTE USER

However, there is a section of code used to convert from BASIC IV to BASIC II machines and if you are going to use your routine on one type of machine only then you may prefer to use the released space for this AUTO-RUN.

Here is a table showing the locations of various bytes that are part of calls into the ROMS that differ between BASIC IV and BASIC II. Owners of BASIC IV machines will not need to make any changes from the hex machine code dump listed. Owners of Basic II machine machines might like to put the relevant BASIC II calls in as they type in the routine, thus releasing the space for an AUTOSTART, or they may prefer the flexibility of the existing routines that will work on both ROMS.

Then for the BASIC IV and BASIC II substitute the following code:

```
0312  A5  AE  F0  11  20  F8  F3  AD
031A  7D  02  85  2A  AD 7E  01  85
0322  2B  85  A2  D0  07  A5  A2  D0
032A  03  6C  FC  FF  A9  00  85  A2
0332  F0  03  EA  EA  EA  4C  9C  02
```

(The circled byte is BASIC IV: substitute B9 for BASIC II)

and, in addition, 20 in 0305 (This replaces the ? mark by a space and tidies up the output), D0 in 030C and F0 in 0310.

This AUTOSTART designed to run the program ONCE ONLY and thereafter a call to SYS772 will reset the machine. To AUTOSTART the instruction is:

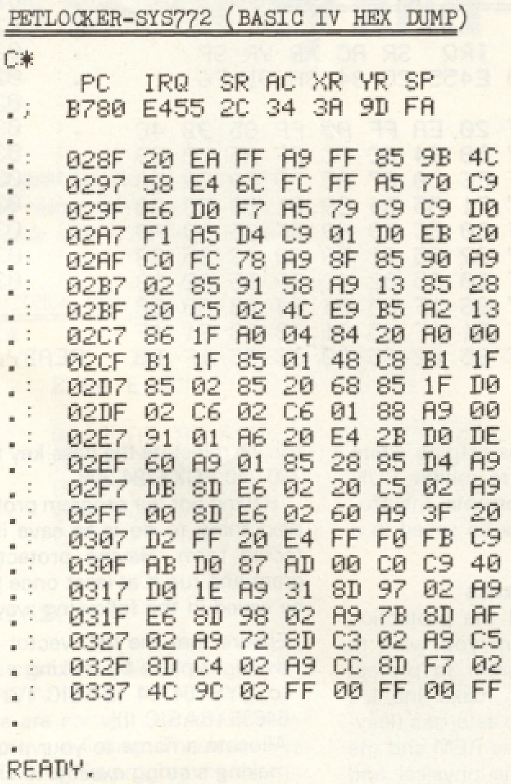
OPEN1:SYS 772

This AUTOSTART is a little more tricky to APPEND than the other since it is designed so that a normal LOAD will reset the machine. Having prepared your program in the way described above (i.e. REM statement with 12 characters, zeroes poked into locations 1025-1041, last statement = SYS752) then append your machine code in the usual way by typing OPEN1.

To run and protect the program use the following commands each time you run:

POKE 174,0:POKE 162,1:SYS772

Having run your program once or twice then restore the IRQ and save it in the way previously described. When loaded back with an OPEN1:SYS772 then the program will load *and* run. A normal LOAD followed by SYS772 will reset the machine (as otherwise there would be no point having an AUTOSTART). If you prefer absolutely maximum security, you can incorporate the password key by POKING 0305 with 3F,030C with F0 and 0310 with D0 but be prepared to see the question mark appear immediately after the name of the program when the header has been found but before the rest of the program is loaded in.



PETLOCKER-SYS772 (BASIC IV HEX DUMP)

```
C*
    PC   IRQ  SR AC XR YR SP
.;  B780 E455 2C 34 3A 9D FA
.
.:  028F 20 EA FF A9 FF 85 9B 4C
.:  0297 58 E4 6C FC FF A5 70 C9
.:  029F E6 D0 F7 A5 79 C9 C9 D0
.:  02A7 F1 A5 D4 C9 01 D0 EB 20
.:  02AF C0 FC 78 A9 8F 85 90 A9
.:  02B7 02 85 91 58 A9 13 85 28
.:  02BF 20 C5 02 4C E9 B5 A2 13
.:  02C7 86 1F A0 04 84 20 A0 00
.:  02CF B1 1F 85 01 48 C8 B1 1F
.:  02D7 85 02 85 20 68 85 1F D0
.:  02DF 02 C6 02 C6 01 88 A9 00
.:  02E7 91 01 A6 20 E4 2B D0 DE
.:  02EF 60 A9 01 85 28 85 D4 A9
.:  02F7 DB 8D E6 02 20 C5 02 A9
.:  02FF 00 8D E6 02 60 A9 3F 20
.:  0307 D2 FF 20 E4 FF F0 FB C9
.:  030F AB D0 87 AD 00 C0 C9 40
.:  0317 D0 1E A9 31 8D 97 02 A9
.:  031F E6 8D 98 02 A9 7B 8D AF
.:  0327 02 A9 72 8D C3 02 A9 C5
.:  032F 8D C4 02 A9 CC 8D F7 02
.:  0337 4C 9C 02 FF 00 FF 00 FF
.
.
.
  READY.
```

Your AUTOSTART can be made to mimic almost exactly the appearance that the screen would have if a 'normal' program had been loaded. All the customary messages appear including the READY. message and the flashing cursor. The screen looks as though it is in direct mode awaiting a command (to RUN,LIST etc) but the AUTOSTART has already started the program running and it actually waiting at the end of line 2 for an input into the AS string variable in the INPUT 1,AS statement. A RUN will cause the program to run normally and a LIST will have dire consequences. Any other input will have no effect. To achieve this effect is really very simple:

Ensure that 0305 has a value of 20, 030C a value of D0 and 0310 a value of F0 (all in hex)

Alter line 2 slightly so that it reads as follows:

2 CLOSE1:OPEN1,0,0:PRINT"
READY.":INPUT 1,AS

When experimenting with this construction I have even fooled myself on occasions, so can vouch for its efficacy. The 'give-away' for those in the know is that syntax error messages are not generated when one might expect them to be e.g. if one tried a direct INPUT statement.

There may be occasions when you yourself would like to list a program that has been 'protected'. To do this, you need to alter the start of BASIC and then enter the 'RESTORE' routine. This again is quite easy but ensure that you only let your friends have the secret!

POKE 40,19: SYS 709 : LIST

To 'corrupt' the program afterwards and reset the start of BASIC then simply use the 'corrupter' call which is normally placed at the end of the program:

SYS 752

You may, for your own purposes, need to store a cassette program on disk. Normally the program will check for this and reset the machine but the following POKE will allow access after the program is loaded but before it is run:

POKE 683,4

Finally, a few disclaimers and reminders. This program is *not* immune from the following: (a) RESET switches of the PRONTO-PET variety (b) TAPE-TO-TAPE copiers (c) Those with a reasonable grasp of 6502 machine code.

```
2 CLOSE1:OPEN1,0,0:PRINT"▓▓READY.":INPUT#1,A$
3 IF LEFT$(A$,4)<>"LIST"THEN5
4 PRINT"▓▓▓NAUGHTY!..NOW COMMITTING SUICIDE!":FORJ=1TO2000:NEXT:SYS665
5 IF LEFT$(A$,3)<>"RUN"THENPRINT:GOTO2
6 CLOSE1
10 PRINT"▓▓PETLOCKER DEMO"
20 PRINT"===============▓"
30 PRINT"▓BY M.C.HART [C] 1983▓"
40 A=TI:FORJ=1TO15:PRINTJ,J*J,SQR(J):NEXT:B=INT((TI-A)*20+0.5)/1000
50 PRINT"▓TIME="B"SECS"
100 REM DEMO PETLOCKER PROTECTION
110 REM
120 REM SYS 772  TO RUN PROGRAM
130 REM
140 REM SYS 752  TO 'CORRUPT' PROGRAM
150 REM   (MAKE THIS LAST LINE)
160 REM
170 REM SYS 709:POKE40,19 TO RESTORE
180 REM
190 REM ENSURE NO TOOLKITS ACTIVATED
195 REM
200 REM TO PROTECT A NEW PROGRAM
210 REM
220 REM --WITH THE PROGRAM TO BE
230 REM   PROTECTED ALREADY LOADED :
240 REM
250 REM + POSITION THIS TAPE AT START
260 REM + LOAD MACHINE CODE BY
270 REM +        'OPEN1'
280 REM
290 REM --MAKE LAST LINE 'SYS 752:END'
300 REM & ENSURE PROGRAM EXITS THERE
310 REM
320 REM --MAKE LINE 1 REM***********
330 REM   THEN POKE1025,0:POKE1026,0
340 REM
350 REM --ENSURE THAT PROGRAM WILL NOT
360 REM   DROP INTO DIRECT MODE BY
370 REM   PREVENTING NULL RETURNS FOR
380 REM   INPUT ETC. OR OTHER CRASHES!
390 REM
400 REM -- RUN BY 'SYS 772' TO PROTECT
410 REM
500 REM TO SAVE PROTECTED PROGRAM
510 REM
520 REM --RUN PROGRAM BEFORE SAVING &
530 REM   ENSURE INTERRUPT CORRECT BY
540 REM   SYS 64704(B4)/SYS 64635(B2)
550 REM
560 REM --ALLOCATE NAME TO N$
570 REM   (MAKE 16 CHARACTERS LONG-PAD
580 REM    WITH SPACES IF NECESSARY)
590 REM
600 REM --SAVE CASSETTE BUFFER #1 THUS
610 REM   A$="":FORJ=0TO170:
620 REM   A$=A$+CHR$(PEEK(655+J)):NEXT
630 REM
640 REM --P$=N$+A$:SAVE BY 'SAVE P$'
650 REM
660 REM *** END OF INSTRUCTIONS ***
670 REM
10000 SYS 752:END:REM DON'T FORGET!
```

Conclusion

Do remember the following points:

After a program run the program can generally be re-run. However, if you intend to save the program in the manner described or load another program then you must restore the IRQ to its normal state.

The responsibility is yours to ensure that the program only exists in one place i.e. the physical and logical end. The reason for this is that the 'corrupter' routine corrupts nearly the whole of the program and would therefore corrupt itself if not placed at the end.

Do not have any TOOL-KITS or the like in operation but ensure that renumbering and 'tidying-up' is done before you start the 'protection'.

You will notice that I have not provided a hex-loader for the routine which I think is fairly easy to load in any case through the monitor SYS4 call. The routine is approximately one screen-full of information (i.e. 22 lines) and should not be too arduous to type in directly.

If any readers would like to save themselves the chore of typing in then I will supply a cassette with the demonstration BASIC program as published and AUTOSTART applications for BASIC IV and BASIC II machines. For this service could you please supply a self-addressed and stamped Post Office padded envelope and a cheque for £5.00. I will also attempt to deal with any problems that you may have in implementing the routines as published.

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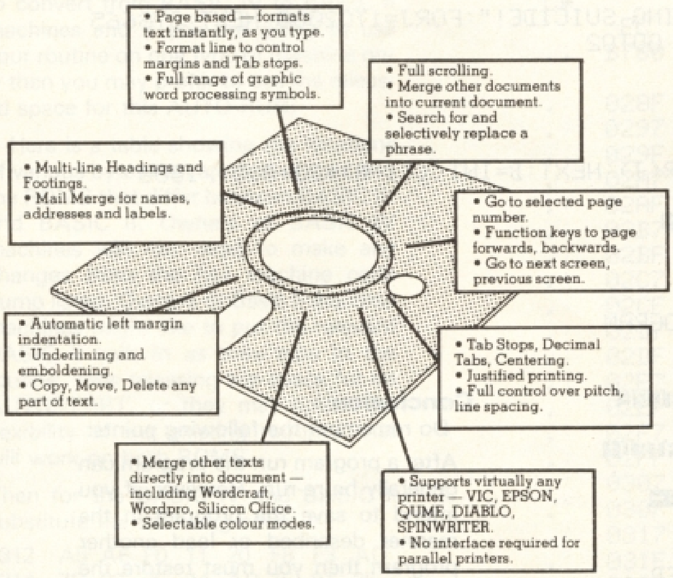

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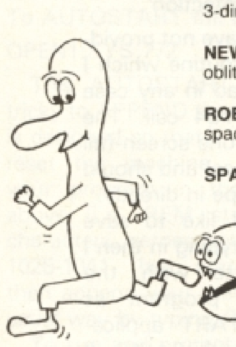

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HINTS & TIPS

Facts & figures for Commodore home users

The following routines are all Machine Code and we have decided to include them as Source Listing, rather than BASIC loaders, so you will need a Monitor or an Assembler or the ability to transfer the listing into a BASIC loader, before you can use them. There are currently One or Two Monitors available on the Market for the 64 and plenty for the VIC. So if you desire one but haven't yet got around to buying it perhaps now is the time? As you will have gathered the Source Listings are for both the 64 and the VIC, in fact they have been duplicated for both Machines where possible.

```
10 READL
20 READA:IFA=999THEN50
30 POKEL,A:L=L+1
40 GOTO20
50 SYS(4109):NEW:END
60 DATA4109,169,160,141,27,16,141,30,16,160,36,162,00,189,00,160,157,00,160
65 DATA232,208,247,238,27,16,238,30,16,136,208,238,169,54,133,01,169
70 DATA76,141,194,189,169,00,141,195,189,169,192,141,196,189,162
75 DATA00,189,80,16,157,00,192,232,224,19,208,245,96,170,170
80 DATA170,170,169,13,32,210,255,165,57,166,58,133,20,134,21
85 DATA32,19,166,32,201,166,999
READY.
```

Another series of routines and suggestions for our readers, most of the routines apply to the '64' and the VIC.

The first routine was sent in by D. Bowler of Scarborough. The routine is a Utility for the 64, which intercepts the ERROR messages (for BASIC) and displays them as usual, but also displays the LINE the ERROR was generated from. For example ... ERROR IN ... where the first set of dots represents the type of ERROR and the second set of dots the LINE number. The program NEW's itself after execution, and will remain in memory unless a RUN/STOP RESTORE or a COLD START (SYS(64738)) are executed. In either case the routine can be reinstated by: POKE 1,54. Another snippet of advice from D. Bowler concerning this routine, is to SAVE the routine before you RUN it as one small mistake will most probably end in the 64 hanging up. The routine is in Machine Code but is given here as a BASIC Loader. Remember to LOAD this routine and RUN it before LOADing any BASIC Programs.

The first routine is a HARD COPY function, on the 64 it occupies addresses 9000 – 905B HEX and 36864 – 36955 DEC. The VIC version occupies addresses 1D00 – 1D5B HEX and 7424 – 7515. Remembering of course that when saving these routines you should add one BYTE to the last address, as it will not be saved. For example, S "HARD COPY", 01,9000,905E will SAVE the HARD COPY function for the 64 onto tape, depending of course on which Monitor or Assembler you are using. The first lines OPEN the printer for output. Address 9014 is a KERNAL routine which opens the printing file. Address 9019 (these are address for the 64 version, the VIC has corresponding Instructions), is a KERNAL routine to OPEN a channel for output. Address 9020 uses a KERNAL routine to output a character to channel. Line 9023 uses a KERNAL routine that checks for the STOP key being pressed. Address 903C outputs another character to channel. Address 9053 outputs another character. The remaining lines are the exit routine, they close the INPUT and OUTPUT channels and the specified logical file. Unfortunately this is only a brief outline of the routine, and may not be easy to follow, however this is all time and space allows. We will in this Issue or the next Issue try to produce a general format for writing BASIC loaders as these are easier to use (although not easier to understand). The HARD COPY routine is not set up to be a Screen Dump but could be simply made to do a Screen Dump by stopping the printer inserting blank lines.

```
.,  9000  A9 04      LDA #$04
.,  9002  85 BA      STA $BA
.,  9004  A9 7E      LDA #$7E
.,  9006  85 B8      STA $B8
.,  9008  A9 00      LDA #$00
.,  900A  A0 04      LDY #$04
.,  900C  85 71      STA $71
.,  900E  84 72      STY $72
.,  9010  85 B7      STA $B7
.,  9012  85 B9      STA $B9
.,  9014  20 C0 FF  JSR $FFC0
.,  9017  A6 B8      LDX $B8
.,  9019  20 C9 FF  JSR $FFC9
.,  901C  A2 19      LDX #$19
.,  901E  A9 0D      LDA #$0D
.,  9020  20 D2 FF  JSR $FFD2
.,  9023  20 E1 FF  JSR $FFE1
.,  9026  F0 2E      BEQ $9056
.,  9028  A0 00      LDY #$00
.,  902A  B1 71      LDA ($71),Y
.,  902C  85 67      STA $67
.,  902E  29 3F      AND #$3F
.,  9030  06 67      ASL $67
.,  9032  24 67      BIT $67
.,  9034  10 02      BPL $9038
.,  9036  09 80      ORA #$80
.,  9038  70 02      BVS $903C
.,  903A  09 40      ORA #$40
.,  903C  20 D2 FF  JSR $FFD2
.,  903F  C8         INY
.,  9040  C0 28      CPY #$28
.,  9042  D0 E6      BNE $902A
.,  9044  98         TYA
.,  9045  18         CLC
.,  9046  65 71      ADC $71
.,  9048  85 71      STA $71
.,  904A  90 02      BCC $904E
.,  904C  E6 72      INC $72
.,  904E  CA         DEX
.,  904F  D0 CD      BNE $901E
.,  9051  A9 0D      LDA #$0D
.,  9053  20 D2 FF  JSR $FFD2
.,  9056  20 CC FF  JSR $FFCC
.,  9059  A2 7E      LDX #$7E
.,  905B  4C C3 FF  JMP $FFC3
```

HINTS & TIPS

```
.,  1D00 LDA #$04     .,  1D20 JSR $FFD2      .,  1D40 CPY #$16
.,  1D02 STA $BA      .,  1D23 JSR $FFE1      .,  1D42 BNE $1D2A
.,  1D04 LDA #$7E     .,  1D26 BEQ $1D56      .,  1D44 TYA
.,  1D06 STA $B8      .,  1D28 LDY #$00       .,  1D45 CLC
.,  1D08 LDA #$00     .,  1D2A LDA ($71),Y    .,  1D46 ADC $71
.,  1D0A LDY #$1E     .,  1D2C STA $67        .,  1D48 STA $71
.,  1D0C STA $71      .,  1D2E AND #$3F       .,  1D4A BCC $1D4E
.,  1D0E STY $72      .,  1D30 ASL $67        .,  1D4C INC $72
.,  1D10 STA $B7      .,  1D32 BIT $67        .,  1D4E DEX
.,  1D12 STA $B9      .,  1D34 BPL $1D38      .,  1D4F BNE $1D1E
.,  1D14 JSR $FFC0    .,  1D36 ORA #$80       .,  1D51 LDA #$0D
.,  1D17 LDX $B8      .,  1D38 BVS $1D3C      .,  1D53 JSR $FFD2
.,  1D19 JSR $FFC9    .,  1D3A ORA #$40       .,  1D56 JSR $FFCC
.,  1D1C LDX #$17     .,  1D3C JSR $FFD2      .,  1D59 LDX #$7E
.,  1D1E LDA #$0D     .,  1D3F INY            .,  1D5B JMP $FFC3
```

The next routine, again for both the 64 and the VIC, is an OLD function. So that a program previously NEWed can be recalled as long as the Machine has not been powered down. The 64 version sits in memory from HEX CF00 – CF3B and the VIC version from 1D00 – 1D3B. There are many versions of this routine floating around, but this did not seem a good enough reason to include this one. The first few lines of the routine look for the start of BASIC program then sets the start address of the BASIC program by locating the first zero after the leading five BYTES, this is where the start address of the BASIC program is located and can now be reset. The pointer is set to the second line of the BASIC program and the first LINE number is restored. This routine is very fast (as it should be), in fact it is instantaneous. It could prove to be very useful if you wish to restore a BASIC program after executing NEW.

```
.,  CF00  A5 2B     LDA $2B
.,  CF02  A4 2C     LDY $2C
.,  CF04  85 22     STA $22
.,  CF06  84 23     STY $23
.,  CF08  A0 03     LDY #$03
.,  CF0A  C8        INY
.,  CF0B  B1 22     LDA ($22),Y
.,  CF0D  D0 FB     BNE $CF0A
.,  CF0F  C8        INY
.,  CF10  98        TYA
.,  CF11  18        CLC
.,  CF12  65 22     ADC $22
.,  CF14  A0 00     LDY #$00
.,  CF16  91 2B     STA ($2B),Y
.,  CF18  A5 23     LDA $23
.,  CF1A  69 00     ADC #$00
.,  CF1C  C8        INY
.,  CF1D  91 2B     STA ($2B),Y
.,  CF1F  88        DEY
.,  CF20  A2 03     LDX #$03
.,  CF22  E6 22     INC $22
.,  CF24  D0 02     BNE $CF28
.,  CF26  E6 23     INC $23
.,  CF28  B1 22     LDA ($22),Y
.,  CF2A  D0 F4     BNE $CF20
.,  CF2C  CA        DEX
.,  CF2D  D0 F3     BNE $CF22
.,  CF2F  A5 22     LDA $22
.,  CF31  69 02     ADC #$02
.,  CF33  85 2D     STA $2D
.,  CF35  A5 23     LDA $23
.,  CF37  69 00     ADC #$00
.,  CF39  85 2E     STA $2E
.,  CF3B  4C 63 A6  JMP $A663

.,  1D00  A5 2B     LDA $2B
.,  1D02  A4 2C     LDY $2C
.,  1D04  85 22     STA $22
.,  1D06  84 23     STY $23
.,  1D08  A0 03     LDY #$03
.,  1D0A  C8        INY
.,  1D0B  B1 22     LDA ($22),Y
.,  1D0D  D0 FB     BNE $1D0A
.,  1D0F  C8        INY
.,  1D10  98        TYA
.,  1D11  18        CLC
.,  1D12  65 22     ADC $22
.,  1D14  A0 00     LDY #$00
.,  1D16  91 2B     STA ($2B),Y
.,  1D18  A5 23     LDA $23
.,  1D1A  69 00     ADC #$00
.,  1D1C  C8        INY
.,  1D1D  91 2B     STA ($2B),Y
.,  1D1F  88        DEY
.,  1D20  A2 03     LDX #$03
.,  1D22  E6 22     INC $22
.,  1D24  D0 02     BNE $1D28
.,  1D26  E6 23     INC $23
.,  1D28  B1 22     LDA ($22),Y
.,  1D2A  D0 F4     BNE $1D20
.,  1D2C  CA        DEX
.,  1D2D  D0 F3     BNE $1D22
.,  1D2F  A5 22     LDA $22
.,  1D31  69 02     ADC #$02
.,  1D33  85 2D     STA $2D
.,  1D35  A5 23     LDA $23
.,  1D37  69 00     ADC #$00
.,  1D39  85 2E     STA $2E
.,  1D3B  4C 60 C6  JMP $C660
READY.
VIC RE-NEW
```

This is a useful routine for Printing at specific areas of the screen. The routine sits in memory at HEX C900 – C9A0 on the 64. The routine first fetches the numeric printout. Then converts it to its ASCII equivalent and prints the string.

The routine is not very complex the final result is that by using this routine with a BASIC program the user can format printing quickly and simply. A BASIC example is included for readers to try and experiment with. Line 10 sets the number to Integer format or fixed point format. If the number after the comma is a one the number is in fixed point format, if it is a zero the number is an Integer. For example if line 10 is:– POKE 51612,0, then it will return an Integer value. Line 20 is the field length, with a min. of zero and a max. of ten. Line 30 is the number of digits after the Decimal point. Line 40 and 50 are the fill characters for field, before and after number. Line 60 calls the Machine Code routine.

```
.,  C900  20 8A AD JSR $AD8A
.,  C903  20 DD BD JSR $BDDD
.,  C906  20 0D C9 JSR $C90D
.,  C909  20 1E AB JSR $AB1E
.,  C90C  60       RTS
.,  C90D  A9 45    LDA #$45
.,  C90F  20 8E C9 JSR $C98E
.,  C912  B0 59    BCS $C96D
.,  C914  AD 9C C9 LDA $C99C
.,  C917  F0 59    BEQ $C972
.,  C919  AD 02 01 LDA $0102
.,  C91C  D0 0B    BNE $C929
.,  C91E  AC 9D C9 LDY $C99D
.,  C921  A9 30    LDA #$30
.,  C923  99 02 01 STA $0102,Y
.,  C926  88       DEY
.,  C927  D0 FA    BNE $C923
.,  C929  A9 2E    LDA #$2E
.,  C92B  20 8E C9 JSR $C98E
.,  C92E  A8       TAY
.,  C92F  90 02    BCC $C933
.,  C931  A0 30    LDY #$30
.,  C933  A9 00    LDA #$00
.,  C935  20 8E C9 JSR $C98E
.,  C938  98       TYA
.,  C939  9D 00 01 STA $0100,X
.,  C93C  A9 2E    LDA #$2E
.,  C93E  20 8E C9 JSR $C98E
.,  C941  AC 9E C9 LDY $C99E
.,  C944  E8       INX
.,  C945  88       DEY
.,  C946  D0 FC    BNE $C944
.,  C948  EC 9D C9 CPX $C99D
.,  C94B  B0 20    BCS $C96D
.,  C94D  AC 9D C9 LDY $C99D
.,  C950  A9 00    LDA #$00
.,  C952  99 01 01 STA $0101,Y
.,  C955  BD 00 01 LDA $0100,X
.,  C958  C9 20    CMP #$20
.,  C95A  D0 02    BNE $C95E
.,  C95C  A9 20    LDA #$20
.,  C95E  99 00 01 STA $0100,Y
.,  C961  CA       DEX
.,  C962  10 06    BPL $C96A
.,  C964  AD 9F C9 LDA $C99F
.,  C967  88       DEY
.,  C968  10 F4    BPL $C95E
.,  C96A  88       DEY
.,  C96B  10 E8    BPL $C955
.,  C96D  A9 00    LDA #$00
.,  C96F  A0 01    LDY #$01
.,  C971  60       RTS
.,  C972  A9 00    LDA #$00
.,  C974  20 8E C9 JSR $C98E
.,  C977  90 F4    BCC $C96D
.,  C979  8A       TXA
.,  C97A  A8       TAY
.,  C97B  AD 02 01 LDA $0102
.,  C97E  F0 09    BEQ $C989
.,  C980  A9 2E    LDA #$2E
.,  C982  20 8E C9 JSR $C98E
.,  C985  90 02    BCC $C989
.,  C987  8A       TXA
.,  C988  A8       TAY
.,  C989  98       TYA
.,  C98A  AA       TAX
.,  C98B  CA       DEX
.,  C98C  10 BA    BPL $C948
.,  C98E  A2 00    LDX #$00
.,  C990  DD 00 01 CMP $0100,X
.,  C993  F0 06    BEQ $C99B
.,  C995  E8       INX
.,  C996  E0 0C    CPX #$0C
.,  C998  D0 F6    BNE $C990
.,  C99A  18       CLC
.,  C99B  60       RTS
.,  C99C  01 09    ORA ($09,X)
.,  C99E  02       ???
.,  C99F  20 FF FF JSR $FFFF
10 POKE51612,1
20 POKE51613,10
30 POKE51614,5
40 POKE51615,ASC("*")
50 POKE51549,ASC("$")
60 SYS(51456) 100
READY.
B*
   PC  SR AC XR YR SP
.;803E 32 00 83 00 F6
```

This routine for the 64 is a short routine for positioning the cursor on the screen. On the 64 the routine sits in memory from locations HEX C000 – C017. The Machine Code checks for the presence of a comma, then gets a byte. Does this again, then sets the position of the cursor, checks again for a comma, then jumps to the PRINT routine. The BASIC program is just a simple example of how to use the routine. Line 10 is the address of the Machine Code routine, Lines 100 – 300 are printing text using the Machine Code routine. Line 400 is a delay loop, line 500 calls the M.C. routine, prints some text and line 600 waits for a key press.

```
.,  C000  20 FD AE JSR $AEFD
.,  C003  20 9E B7 JSR $B79E
.,  C006  8A       TXA
.,  C007  48       PHA
.,  C008  20 FD AE JSR $AEFD
.,  C00B  20 9E B7 JSR $B79E
.,  C00E  68       PLA
.,  C00F  A8       TAY
```

HINTS & TIPS

```
., C010  18          CLC
., C011  20 F0 FF JSR $FFF0
., C014  20 FD AE JSR $AEFD
., C017  4C A4 AA JMP $AAA4
READY.

10 PR=12*4096
100 SYSPR,10,10,"DEMONSTRATES"
200 SYSPR,10,20,"CURSOR CONTROL"
300 SYSPR,10,0,"THIS PROGRAM"
400 FORDE=1TO2000:NEXT
500 SYSPR,10,5,"▚HIT ANY KEY■"
600 GETA$:IFA$=""THEN400
READY.
```

An instructional demo on setting up sprites is included this month. The program simply sets up sprites 0 and 1 and displays them in the top left of the screen and then stops the sprites are in data statements. Nothing much else to say about this routine except that it is only one of many ways of setting up and using sprites. Also included are a list of symbols for the 64, note that the cursor left and function key appear to be the same, as does the reverse off key. Also the symbol for red appears in the list as a reversed pound symbol, but on many printers it will appear as a reversed backslash. There are several ways of collecting an input as mentioned earlier most Commodore machines will not except a return on an input although the 64 will except a null string it sets it to a blank or zero if numeric input. This is to be avoided if possible as it may well affect programs at later stages. Of course the GET command is a respectable way of checking for a key press. Therefore 10 GET A$: IF A$ = " " THEN 10, will check for a key press as will the following: 10 IF PEEK (197) = 64 THEN 10, as 64 is the code for no key input. Equally a line like 10 IF PEEK (197) <> 4 AND PEEK (197) <> 5 AND PEEK (197) <> 6 AND PEEK (197) <> 3 THEN 10. Will check for the function keys being pressed. The codes are; 4 = 'F1' key 5, = 'F3' key 6, = 'F5' and 3 = 'F7'. There are many other ways of using this method of fetching a key input if you are not acquainted with it already, experiment. The format is similar to that used in the GET instruction. If you study your manual for the 64 or the VIC you will discover that you can use PEEK (203) in a similar way. The WAIT instruction can be used to collect keyboard input as well as joystick and cassette switch sense. The format for the WAIT instruction is as follows: WAIT 197,16:WAIT197,16,16 waits for any input from the keyboard. The format for tape is: WAIT 1,16,16 waits for any key to be pressed on tape and the format for the joystick on the 64 is as follows: WAIT 53260, 16,16 will wait for the fire button to be pressed on port 2, if you wish to use port one then the command is the same, but the address is one higher 53261. Included is a short routine that will collect the joystick controls for the 64 on port 2. Line 10 waits for the fire button to be pressed, line 30 waits for joystick right, line 50 waits for joystick left, line 70 waits for joystick down and 90 waits for joystick up. If you have any comments about any of the routines please write in and let us know and we will publish them.

```
READY.

20 V=53248
30 POKEV+32,15:POKEV+33,14
40 PRINT"♥"
50 POKEV+21,3
60 POKEV+28,3
70 POKEV+39,6
80 POKEV+40,2
90 POKEV+37,14
 100 POKEV+38,0
 110 POKE2040,13
 120 POKE2041,13
 130 FORI=0TO62
 140 READX
 150 POKE832+I,X
 160 NEXTI
 170 POKEV+0,24:POKEV+1,50
 180 POKEV+2,60:POKEV+3,50
 190 END.
 1000 DATA000,000,000
 1010 DATA000,000,000
 1020 DATA000,000,000
 1030 DATA000,000,000
 1040 DATA000,000,000
 1050 DATA000,000,000
 1060 DATA000,000,000
 1070 DATA003,255,255
 1080 DATA000,002,000
 1090 DATA192,170,128
 1100 DATA194,150,080
 1110 DATA234,150,080
 1120 DATA194,170,168
 1130 DATA192,170,168
 1140 DATA000,032,128
 1150 DATA000,170,060
 1160 DATA000,000,000
 1170 DATA000,000,000
 1180 DATA000,000,000
 1190 DATA000,000,000
 1200 DATA000,000,000
 READY.
  10 WAIT 56320,16,16
  20 PRINT"FIRE"
  30 WAIT 56320,8,8
  40 PRINT"EAST"
  50 WAIT 56320,4,4
  60 PRINT"WEST"
  70 WAIT 56320,2,2
  80 PRINT"SOUTH"
  90 WAIT 56320,1,1
  100 PRINT"NORTH"
  READY.

  WAIT JOYSTICK
```

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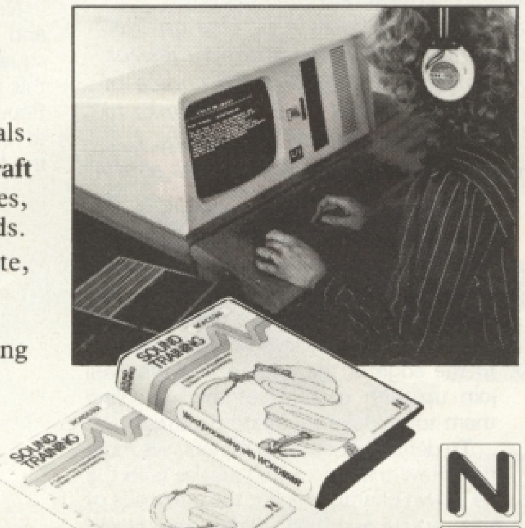

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SOUND & VISION

'A look at sight and sound on the Commodore 64'

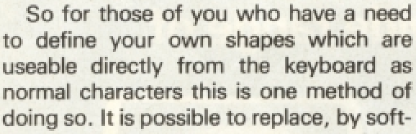
This month we take a look at user defined characters on the 64; a small demonstation program of how to manipulate Sprites on the screen and a program that turns the 64 into a keyboard and synthesizer with full use of Ring modulation, Syncronisation, Filters and a choice of any combination of the three voices available. First I must say thanks to D.Bowler of Scarborough for the article on user defined characters. I found this article very informative and I hope that you will find it as useful.

User Defined Characters on the 64

The Sprites on the 64 provide means for the user to define his own shapes and move them about the screen with reasonable ease but they have their limitations. Only 8 Sprites can be displayed on the screen at any one time and if you need a shape the size of an ordinary character, there is a lot of superfluous data involved in the defining of the Sprite. In addition, Sprites are not obtainable directly from the keyboard, they have to be presented, coloured, and moved with a series of POKE statements or the equivalent in machine code.

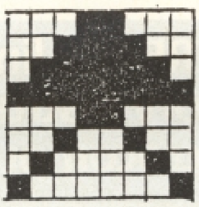
So for those of you who have a need to define your own shapes which are useable directly from the keyboard as normal characters this is one method of doing so. It is possible to replace, by software, the entire set of characters resident in the CBM-64. However, for most purposes, a number of the normal characters (such as the letters and figures) will probably be required in addition to the shapes you wish to design yourselves. We will therefore keep all the characters listed on pages 132 to 134 of the 64 user manual under the columns headed Set 1. The reverse image of these characters is the area where we will design our own shapes.

Every character on the 64 is designed on a grid of 8 bits by 8 bits giving a block of 64 bits per character. To give them their proper name these bits are called pixels. If we examined the two characters @ and A on their grids they would appear as in fig.a.

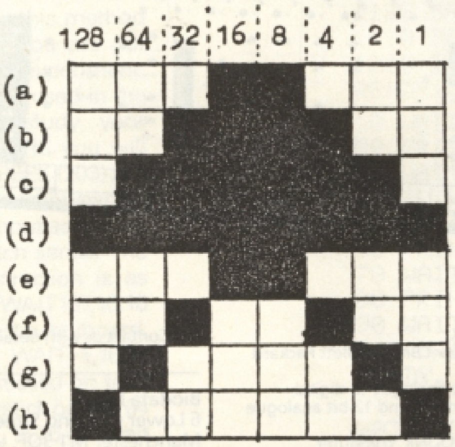


Note that with these characters, the bottom, left, and right hand edges of the grid have been left empty. This is to prevent adjacent characters merging into each other when they are printed on the screen. The graphics characters go right to the edge of the grid so that they will join up with each other thus enabling them to be used to create pictures.

To define our own characters, we must first draw them on a grid just as with the 64's own characters. For the purposes of this article we will create the shape shown in fig. b. drawn onto an 8 by 8 grid.



The principle is that all the squares which we have filled in will be switched 'on' on the screen whereas the empty squares will be 'off' and thus invisible. Somehow we have to tell the computer which squares to switch on and which to switch off. This is accomplished by giving each column of the grid a value from 128 down to 1. This is shown in fig. c.



Now look at the top row (a) of the grid and add together the values of all the squares which we want switched on. In this particular case we get a result of 24. Repeat this for all the remaining rows (b to h). You should now have 8 values as in the table below.

Row (a)	24
Row (b)	60
Row (c)	126
Row (d)	255
Row (e)	24
Row (f)	36
Row (g)	66
Row (h)	129

These 8 values will be needed later on to inform the computer which bits (pixels) we want switched on and which ones should be off.

Having designed our own character on paper and calculated the necessary information from our drawing we can now turn to the 64 itself.

The shape of the resident characters in the 64 is stored in ROM and as such cannot be altered by software. However, there is nothing to prevent us copying this ROM into RAM where we can play around with it at will.

The ROM containing the shapes of the resident 64's characters is to be found at address 53248 ($D000) to 57343 ($DFFF). Because of the way the 64 is cofigured, we cannot get at this ROM directly as it is sandwiched between the I/O ROM (sitting on top of it) and RAM (underneath it). We must uncover the character ROM by switching away the overlying I/O ROM and this is easily accomplished with POKE 1,51. However, the system interrupts expect to find the I/O in place so first we must disable the interrupts with POKE 56333,127. If we did not do this, the machine would suffer a crash and we would need to switch off and start again. Now we have the first two lines of a program to design our own character shape(s) (see listing at end).

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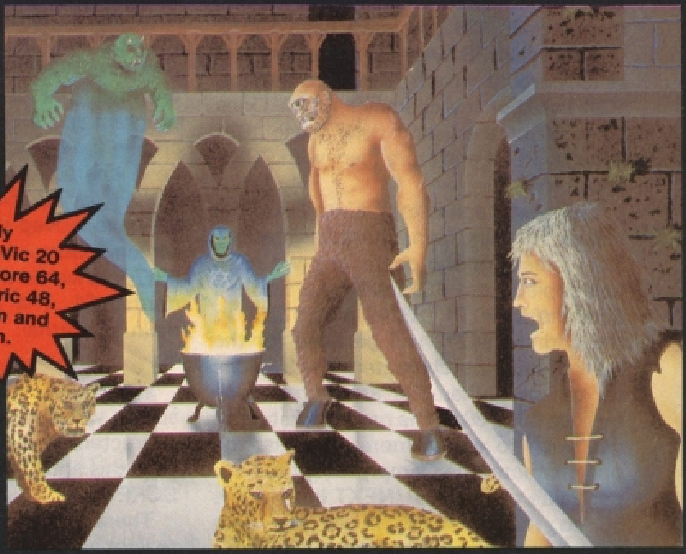

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Having exposed the character ROM we can now proceed to copy what we want of it into RAM. As mentioned before, there is RAM underneath the character ROM so we will use that to house our new character base. We decided earlier that we would like to have available a number of the original characters - 128 of them in fact. 128 characters have a total of 1024 values (8 bytes per character) and as luck would have it, these are the first 1024 bytes of the character ROM. Lines 30 to 50 of the listing copy these 1024 bytes by PEEK and store them with POKE into RAM.

The next stage is to put into RAM the values for our own character design. The values for the characters we have just copied from ROM will have finished at address 54271 (53248 plus 1023) so the address 54272 will be used for the start of our own character. The 8 values for our own character are stored away by lines 60 to 80 of the program listing. If you wish to create more than just the one character then simply adjust the upper value of the FOR/NEXT loop in line 60 so that it reads in all the data necessary for your characters.

With this accomplished we can now restore the I/O ROM to normal and switch the interrupts back on as in lines 90 to 100.

Three more POKES are necessary to tell the video chip where to find the video RAM which we have also had to move. These are the three POKE's in lines 110 to 130.

The final configuration of the 64 is:

Video RAM starting at 50176
Character base at 53248

This leaves sufficient room for you to construct up to 128 characters of your own design if necessary and still keep the 128 which we copied from the character ROM. To display the character we have just designed simply run the program and then switch the reverse on and hit the *f* key. If you wish to poke the new character to the screen simply POKE.....,128. Remember though that we have moved the video RAM and the screen addresses will now go from 50176 upwards and not 1024 as in the normal 64. The POKE's for colour remain as normal.

When you RUN the program the screen will display some 'funny' looking characters where any writing was. Ignore this and simply do a normal CLEAR SCREEN.

There is another feature which comes to light as a result of this interfering with the internal settings of the 64. Having moved the video RAM we have to adjust some of our calculations if we wish to display Sprites at the same time as using our own character designs. An added bonus, however, is that the Sprites get a bit bigger. Instead of being 24 pixels wide by 21 high they become 24 wide by 24 high (i.e. equivalent to three complete characters).

The new figures to handle Sprites are as follows:

Data pointers 2040 to 2047 become 51192 to 51199.

To find where to put the data to define the Sprite use the formula -49012+(74*A) where A is the data block you wish to point the Sprite at.

For example, if you wish to point the Sprite to data block 13 (i.e. POKE 51192,13) you need to store the Sprite data at 49974 upwards. Don't forget the enlarged size of the Sprites means that each one will now need 72 bytes of data and not the 63 which they require under normal circumstances.

As a final note on the defining of characters, the use of the RESTORE key is not recommended with the 64 reconfigured as above. If you do use it you may be lucky enough to be able to recover by typing SYS 64738 (cold start). Although you will have lost any program that was in RAM you will be able to reactivate your new character base by entering in immediate mode lines 110, 120, and 130 of the program.

Program to produce one user-defined character plus 128 of the 64's normal character set:

```
10 poke56333,127                      :rem disable interrupts
20 poke1,51                           :rem switch out i/o rom
30 for x=0 to 1023                    :rem copy 128 characters from rom -
40 poke53248+x,peek(53248+x)          :rem into ram
50 next
60 for x=0 to 7                       :rem read in data for our new character
70 read a:poke54272+x,a               :rem and store it from 54272 upwards
80 next
90 poke1,55                           :rem replace i/o rom
100 poke56333,129                     :rem re-enable interrupts
110 poke648,196                       :rem set pointers for video chip to
120 poke56576,4                       :rem access new character base and video
130 poke53272,21                      :rem ram location
150 data 24,60,126,255,24,36,66,129
```

Last month there appeared a Character Editor program which allowed the user to create user-defined characters on the 64. The data that this program produced can be used with the above configuration if the first number on the data statement is removed. This is because the first number is the location at which the character data starts and this would be different for the above configuration.

Sprites on the 64

Above was mentioned the drawbacks of Sprites for displays, This section will inform you of the advantages of Sprites and how to control them.

One of the major advantages of Sprites are that they may be displayed at any position on the screen. User-defined (or normal) characters are limited to the character locations on the screen which means that when movement of the display is required, the characters may only be moved in the character locations therefore not really giving the effect of contiuous movement. Where as Sprites may be moved in steps of one pixel, that is, with 8 times the accuracy as that of the characters.

What I believe to be the major attribute of Sprites is that when they are moved over an existing display, the display is not wiped out but instead the sprites are displayed on top of the existing display. The existing display can be seen through any transparencies of the Sprites.

When a display is required that takes up more than the size of one character, and the display is required to move, with characters the moving of the display is very tedious and does not give a very good display while moving when characters are used but with a Sprite, two or maybe three POKE's are all that is required to move the display.

This is o.k. so long as the actual display falls into the limits of the dimensions of the Sprite. If the display needed is larger than the dimensions of the Sprite, then either the Sprite can be expanded in either the X axis, the Y axis, or both, with the loss of resolution of the display, or the display can be made up of more than one sprite.

The listing below is a demonstration of how to use two Sprites to make up one picture, and how to move them together. The display that will appear is roughly like the starship enterprise from the series startrek.

This program will hopefully be of interest to those owners of CBM-64's with little knowledge of the machine.

```
READY.

1 REM PROGRAM TO DEMONSTRATE THE USE OF SPRITES
2 REM ********************************************
3 REM
5 REM LOAD SPRITE DATA INTO MEMORY FROM DATA STATEMENTS
6 REM
10 FORI=0TO1
20 READ NO
30 FORJ=0TO62
40 READ X
50 POKENO*64+J,X
60 NEXT J
70 POKE2040+I,NO
80 NEXT I
90 PRINT"▒▒  DEMONSTRATION OF HOW TO USE MORE THAN ";
100 PRINT"▒      ONE SPRITE TO CREATE A DISPLAY      ▒"
110 V=53248:REM START OF VIDEO CHIP
120 POKEV+32,12:POKEV+33,12:REM SCREEN AND BORDER COLOURS
130 POKEV+23,0:POKEV+29,0:REM X AND Y SMALL
135 POKEV+39,2:POKEV+40,2:REM SPRITE COLOURS ARE RED
140 X=150:Y=150:REM COORDINATES OF SPRITES
144 REM
145 REM PUT SPRITES ON THE SCREEN
146 REM
150 POKEV,X:POKEV+1,Y
160 POKEV+2,X+24:POKEV+3,Y
164 REM
165 REM ENABLE SPRITES 0 AND 1
166 REM
170 POKEV+21,3
180 PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
190 PRINT" ▒▒HIT ANY KEY TO SEE ENLARGED PICTURE   ▒"
200 GETA$:IFA$=""THEN200
204 REM
205 REM DISABLE SPRITES
206 REM
210 POKEV+21,0
220 PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
230 PRINT"                                            ▒"
235 X=126:Y=140
240 POKEV+23,3:POKEV+29,3:REM X AND Y ENLARGED
244 REM
245 REM REPOSITION SPRITES ON THE SCREEN
246 REM
250 POKEV,X:POKEV+1,Y
260 POKEV+2,X+48:POKEV+3,Y
264 REM
265 REM ENABLE SPRITES 0 AND 1
266 REM
270 POKEV+21,3
280 PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
290 PRINT" ▒▒  CHOOSE A COLOUR (0-9, RET TO EXIT   ▒"
300 GETA$:IFA$=""THEN300
310 IFA$=CHR$(13)THEN350
320 A=VAL(A$)
324 REM
325 REM COLOUR LOCATIONS FOR SPRITES 0 AND 1
326 REM
```

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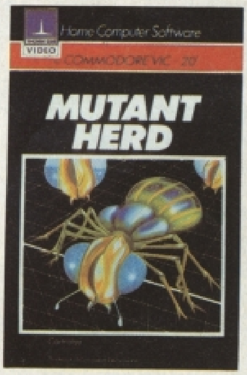
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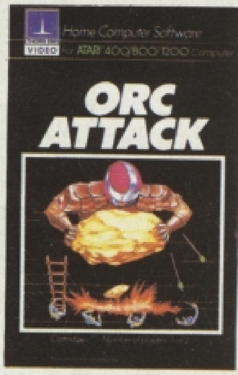
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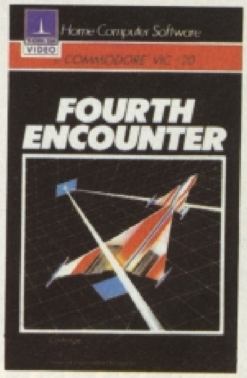
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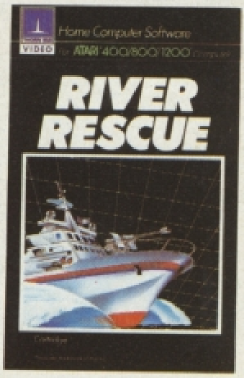
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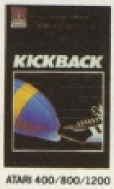

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```
330 POKEV+39,A:POKEV+40,A
340 GOTO300
350 PRINT"🆂🆀🆀🆀🆀🆀🆀🆀🆀🆀🆀🆀🆀🆀🆀🆀🆀🆀🆀🆀"
360 PRINT"   🆀█MOVE THE FICTURE WITH THE CURSOR KEYS"
370 PRINT"   🆀     HIT RETURN TO END DEMO           ⏋"
380 GETA$:IFA$=""THEN380
390 IFA$="🆀"ANDY<254THENY=Y+2:GOTO440
400 IFA$="⏋"ANDY>1THENY=Y-2:GOTO440
410 IFA$="▐"ANDX<340THENX=X+2:GOTO440
420 IFA$="▌"ANDX>1THENX=X-2:GOTO440
425 IFA$=CHR$(13)THEN470
430 GOTO380
434 REM
435 REM PUT NEW POSITIONS FOR SPRITE
436 REM
440 REM
441 IF X>255 THEN POKEV+16,PEEK(V+16)OR1:GOTO 443
442 POKEV+16,PEEK(V+16)AND254
443 POKEV,X-INT(X/256)*256
444 POKEV+1,Y
450 IF X+48>255 THEN POKEV+16,PEEK(V+16)OR2:GOTO 452
451 POKEV+16,PEEK(V+16)AND253
452 POKEV+2,X+48-INT((X+48)/256)*256
453 POKEV+3,Y
454 REM
460 GOTO380
464 REM
465 REM DISABLE SPRITES, CLEAR SCREEN,
466 REM AND RESTORE DEFAULT COLOUR COMBINATIONS
467 REM
470 POKEV+21,0:PRINT"▣";
480 POKEV+33,6:POKEV+32,14
490 END
29970 REM
29980 REM SPRITE DATA STORED FROM HERE ON
29990 REM
30000 DATA224
30001 DATA0,0,0,0,0,0,0
30002 DATA0,0,0,0,0,0,0
30003 DATA0,0,0,0,0,0,3
30004 DATA0,0,7,31,255,131,15
30005 DATA255,192,7,255,128,0,28
30006 DATA0,0,28,0,0,14,0
30007 DATA0,14,0,0,7,1,0
30008 DATA7,1,0,31,255,0,15
30009 DATA255,0,7,255,0,0,0
30010 DATA225
30011 DATA0,0,0,0,0,0,0
30012 DATA0,0,0,192,0,3,240
30013 DATA0,7,248,0,255,255,240
30014 DATA255,255,248,255,255,240,56
30015 DATA192,0,56,0,0,112,0
30016 DATA0,112,0,0,224,0,0
30017 DATA224,0,0,192,0,0,192
30018 DATA0,0,252,0,0,254,0
30019 DATA0,252,0,0,0,0,0
30020 DATA-1
READY.
```

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A Keyboard Program for the 64

This program lets the user make full use of the 64's sound capabilities.

To choose which combination of voices to use, I have produced a table below:

0 = Turns off all three voices. 1 = Turns on voice one alone. 2 = Turns on voice two alone. 3 = Turns on voices one and two. 4 = Turns on voice three alone. 5 = Turns on voices one and three. 6 = Turns on voice two and three. 7 = Turns on all three voices.

```
READY.

10 DIM N(64)
20 FOR I=0 TO 64
30 READ A
40 N(I)=A
50 NEXT I
60 DATA ,-1,,,,,,
70 DATA 65539,9854,4389,65540,2195,4927
80 DATA 11060,,65541,11718,5530,65542,2765,5859
90 DATA 13153,2463,65543,14764,6577,,3288,7382
100 DATA 16572,2930,,17557,8286,65536,4143,8779
110 DATA ,3691,,,,,,,,4389,,
120 DATA ,,,,,65537,,,65538,
130 DATA ,8779,,
140 S=54272
150 V=1:LK=64:LS=0
160 FOR I=0 TO 2
170 READ W(I),A(I),D(I),SU(I),R(I),PW(I),W$(I),SY(I),RM(I),FI(I)
180 POKES+I*7+4,W(I)*16+RM(I)*4+SY(I)*2
190 POKE S+I*7+5,A(I)*16+D(I)
200 POKE S+I*7+6,SU(I)*16+R(I)
210 P1=INT(PW(I)/256)
220 P2=PW(I)-P1*256
230 POKE S+I*7+2,P2
240 POKE S+I*7+3,P1
250 NEXT I
260 DATA 4,0,9,0,0,2048,"PULSE",0,0,0
270 DATA 1,4,2,10,5,0,"TRIANGLE",0,0,0
280 DATA 2,6,5,2,2,0,"SAWTOOTH",0,0,1
290 READ FF,FR,FB,FB$
300 POKES+23,FR*16+FI(0)+FI(1)*2+FI(2)*4
310 POKES+21,FFAND7
320 POKES+22,INT((FF-(FFAND7))/8)
330 POKES+24,FB*16+15
340 DATA 1024,12,4,"HI"
350 GOSUB 5000
360 GOTO 3010
1000 K=PEEK(197):PS=PEEK(653)
1010 IF K=LK AND PS=LS THEN 1000
1020 F=N(K):LK=K:LS=PS
1030 IF F=0 THEN 2000
1040 IF F>65535 THEN 3000
1045 IF F=-1 THEN 4000
1050 IF PS=1 THEN F=INT(F*2↑(1/12))
1060 IF PS=2 THEN F=INT(F/2↑(1/12))
1070 F1=INT(F/256)
1080 F2=F-F1*256
1085 FOR I=0 TO 2
1086 IF VO(I)=0 THEN 1125
1090 POKE S+I*7+4,0
1100 POKE S+I*7+4,W(I)*16+RM(I)*4+SY(I)*2+1
```

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64

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```
1110 POKE S+I*7,F2
1120 POKE S+I*7+1,F1
1125 NEXT I
1130 GOTO 1000
2000 FOR I=0 TO 2
2010 POKE S+I*7,0
2020 POKE S+I*7+1,0
2030 POKE S+I*7+4,W(I)*16
2040 NEXT I
2050 GOTO 1000
3000 V=F-65536
3010 FOR I=0 TO 2
3020 VO(I)=(VAND2↑I)/2↑I
3030 NEXT I
3040 GOTO 1000
4000 POKE 53280,14:POKE 53281,6
4005 PRINT"▒";
4010 FOR I=0 TO 2
4020 PRINT"▒";TAB(10*I+10);"▒▒VOICE";I+1
4030 PRINT"▒▒WAVEFORM▒";TAB(10*I+10);W$(I)
4040 PRINT"▒▒ATTACK   ▒";TAB(10*I+10);A(I)
4050 PRINT"▒▒DECAY    ▒";TAB(10*I+10);D(I)
4060 PRINT"▒▒SUSTAIN ▒";TAB(10*I+10);SU(I)
4070 PRINT"▒▒RELEASE ▒";TAB(10*I+10);R(I)
4080 PRINT"▒▒P. WIDTH▒";TAB(10*I+10);PW(I)
4081 PRINT"▒▒SYNC     ▒";TAB(10*I+10);SY(I)
4082 PRINT"▒▒RING MOD▒";TAB(10*I+10);RM(I)
4083 PRINT"▒▒FILTER   ▒";TAB(10*I+10);FI(I)
4090 NEXT I
4091 PRINT"▒▒FILTER FREQ. ▒";FF
4092 PRINT"▒FILTER RES.   ▒";FR
4093 PRINT"▒FILTER BAND   ▒ ";FB$
4100 POKE 198,0
4110 PRINT"▒▒ DO YOU WISH TO CHANGE THE VALUES ? ";
4120 GET A$:IF A$<>"N" AND A$<>"Y" THEN 4120
4130 IF A$="N" THEN GOSUB 5000:GOTO 1000
4140 PRINT"YES"
4150 PRINT"▒WHICH VOICE DO YOU WISH TO CHANGE ? ",
4160 GET A$:IF A$="" THEN 4160
4170 IF ASC(A$)<49 OR ASC(A$)>51 THEN 4160
4180 PRINTA$:VV=VAL(A$)
4190 PRINT "▒WAVEFORM          ? ";
4200 GETA$:IFA$<>"S"ANDA$<>"N"ANDA$<>"P"ANDA$<>"T"THEN4200
4210 IF A$="N" THEN PRINT"NOISE":W$(VV-1)="NOISE":W(VV-1)=8
4220 IF A$="P" THEN PRINT"PULSE":W$(VV-1)="PULSE":W(VV-1)=4
4230 IF A$="S" THEN PRINT"SAWTOOTH":W$(VV-1)="SAWTOOTH":W(VV-1)=2
4240 IF A$="T" THEN PRINT"TRIANGLE":W$(VV-1)="TRIANGLE":W(VV-1)=1
4250 INPUT"▒ATTACK                    ▒▒▒▒▒▒";A(VV-1)
4260 IF A(VV-1)<0 OR A(VV-1)>15 THEN PRINT"▒";:GOTO 4250
4270 INPUT"▒DECAY                     ▒▒▒▒▒▒";D(VV-1)
4280 IF D(VV-1)<0 OR D(VV-1)>15 THEN PRINT"▒";:GOTO 4270
4290 INPUT"▒SUSTAIN                   ▒▒▒▒▒▒";SU(VV-1)
4300 IF SU(VV-1)<0 OR SU(VV-1)>15 THEN PRINT"▒";:GOTO 4290
4310 INPUT"▒RELEASE                   ▒▒▒▒▒▒";R(VV-1)
4320 IF R(VV-1)<0 OR R(VV-1)>15 THEN PRINT"▒";:GOTO 4310
4330 INPUT"▒PULSE WIDTH                  ▒▒▒▒▒▒▒▒▒▒";PW(VV-1)
4340 IF PW(VV-1)<0 OR PW(VV-1)>4095 THEN PRINT"▒";:GOTO 4330
4341 INPUT"▒SYNC                      ▒▒▒▒▒▒";SY(VV-1)
4342 IF SY(VV-1)<0 OR SY(VV-1)>1 THEN PRINT"▒";:GOTO 4341
4344 INPUT"▒RING MOD                  ▒▒▒▒▒▒";RM(VV-1)
4345 IF RM(VV-1)<0 OR RM(VV-1)>1 THEN PRINT"▒";:GOTO 4344
```

```
4346 INPUT"▒FILTER                  ▒▒▒▒▒▒▒";FI(VV-1)
4347 IF FI(VV-1)<0 OR FI(VV-1)>1 THEN PRINT"]";:GOTO 4346
4350 POKE S+(VV-1)*7+4,W(VV-1)*16+RM(VV-1)*4+SY(VV-1)*2
4360 POKE S+(VV-1)*7+5,A(VV-1)*16+D(VV-1)
4370 POKE S+(VV-1)*7+6,SU(VV-1)*16+R(VV-1)
4380 P1=INT(PW(VV-1)/256)
4390 P2=PW(VV-1)-P1*256
4400 POKE S+(VV-1)*7+2,P2
4410 POKE S+(VV-1)*7+3,P1
4420 T=TI
4430 IF TI-T<50 THEN 4430
4450 INPUT"FILTER FREQUENCY                   ▒▒▒▒▒▒▒▒";FF
4460 IF FF<0 OR FF>2047 THEN PRINT"]";:GOTO 4450
4470 INPUT"FILTER RES                         ▒▒▒▒▒▒▒";FR
4480 IF FR<0 OR FR>15 THEN PRINT"]";:GOTO 4470
4490 INPUT"FILTER BAND(HI,LO,OR BAND)           ▒▒▒▒▒▒▒▒▒▒▒";FB$
4500 IF FB$="HI" THEN FB=4:GOTO4540
4510 IF FB$="LO" THEN FB=1:GOTO4540
4520 IF FB$="BAND" THEN FB=2:GOTO4540
4530 PRINT"]";:GOTO 4490
4540 POKES+24,FB*16+15
4550 POKES+23,FR*16+FI(0)+FI(1)*2+FI(2)*4
4560 POKES+21,FFAND7
4570 POKES+22,INT((FF-(FFAND7))/8)
4580 GOTO 4000
5000 POKE 53280,4:POKE 53281,2
5005 PRINT"▒▒▒**********     64 KEYBOARD      **********▒"
5010 PRINT" USE THE KEYS ▒Q W E R T Y U I▒"
5020 PRINT"▒                  ▒A S D F G H J K▒"
5030 PRINT"▒                  ▒Z X C V B N M ,▒"
5040 PRINT"▒▒ FOR THE THREE AVAILABLE OCTAVES."
5050 PRINT"▒ USE THE ▒SHIFT▒ KEY FOR A SHARP,"
5060 PRINT"▒            ▒CBM▒    KEY FOR A FLAT."
5070 PRINT"▒▒USING KEYS ▒▒ 1 2 3 4 5 6 7▒ YOU MAY"
5080 PRINT"CHOOSE ANY COMBINATION OF THE THREE"
5090 PRINT"VOICES. THEY ARE SET UP BY USING BINARY"
5100 PRINT"ARITHMETIC. THEREFORE, VOICE 1 IS TURNED";
5110 PRINT"ON USING KEY 1, VOICE 1 AND 3 ARE TURNED";
5120 PRINT"ON USING KEY 5,ETC"
5130 PRINT"▒USE THE ▒RETURN▒ KEY TO CHANGE THE VALUES"
5140 PRINT"IN THE VOICES▒"
5150 RETURN
READY.
```

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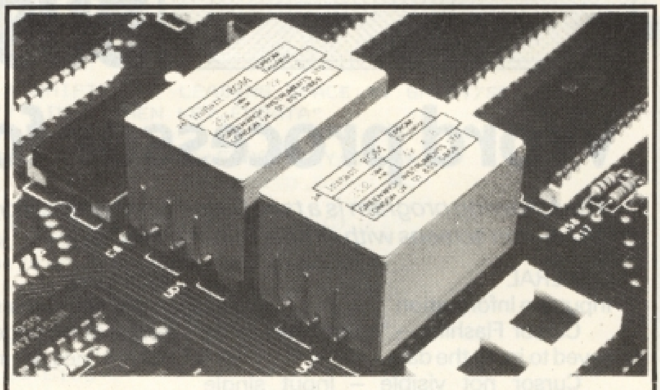

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GCC1 PETCLOCK	£62.00

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Word processor for Commodore users

The following program is a tape based word processor, operating on all 40 column screens with simple minor changes.

GENERAL

Inputting Information

Cursor Flashing – "return" has to be keyed to input the data.

Cursor not visible – Input single characters only. If "return" keyed, then the program will 'crash out.' To restart the program running type in "cont." If this does not work type in "go to 16."

If at any stage should the program 'crash out' the appropriate menu is returned on typing "go to 16."

MENU 1 (Single key inputs)

Command	Function
L	Transfers the computer into lower case giving small and capital letters.
I	Allows data to be typed into the computer.
R	Allows data to be read off tape.

COMMAND "I"

No of pages – Memory size restricts the number of pages to 4 when 60 line pages are used. However shorter pages will allow more pages.

No of columns – The page is divided in to columns for purposes of inputting the data. 1 column is a full width page.

No of lines – This defines the length of the page to be stored. The print out is 6 lines per inch.

Code Words (TO BE TYPED ON A LINE ON THEIR OWN)

dubble – Causes the next line to be printed double width

boled – Causes the next line to be printed "heavy"

mini – Causes the next line to be printed small

ovpr – Prevents a line feed so an underline can be done using shift/←

pawes – Brings the "COMPUTER RESERVED" notice to the screen

MENU 2 (Single key inputs)

This menu is returned when there is data stored in the program.

Command	Function
D	Displays data on the screen so that it can be checked.
P	Allows data to be printed.
E	Allows data to be edited.
S	Allows data to be stored on tape.
W	Reserves Computer.

COMMAND "D"

The data is printed on to the screen and is slowly scrolled.

Key "P" to stop the scroll.

Key "J" to jump to the next page/-menu 2.

COMMAND "E"

Command	Function
Y	Cursor drops to line indicated so that it can be edited.
N	Advances indicator by one line.
I	Inserts a blank line. All lines from the indicator to the bottom of the page drop one line. THE BOTTOM LINE IS LOST.
D	Deletes the indicated line and all the lines below move up one.
J	Allows the next page to be edited or returns to menu 2.
line no.	Typing the line number will allow that line to be indicated.

```
0 REM******WORD PET**********15.4.83*********
1 REM*****FROM AN ORIGINAL IDEA BY STEVE BURDEN*********
2 CLR:POKE59468,12:C9=0:WB=0:PR=0:I=1:V=1:YC=0:WC=0:SQ=0:FY$="W":GOTO8
4 GETDZ$:IFDZ$=""THEN4
6 RETURN
8 H$="                                                                    "
10 H$=H$+"          "
12 LH$="-----------------------------------------------------------------------"
14 LH$=LH$+"---------------"
16 PRINT"3          WORD PET ":IFPR=0THENPRINT"FOR LOWER CASE"
18 IFPR=0THENPRINT"WITH CAPS KEY..........L":PRINT:GOTO22
20 PRINT"3":IFPR=1THENPRINT""
22 IFW=0THENPRINT"TO INPUT DATA KEY        .I":PRINT"TO READ DATA KEY        R"
24 IFW=0THEN32
26 PRINT"TO DISPLAY DATA KEY     D":PRINT"TO PRINT DATA KEY      P"
28 PRINT"TO EDIT DATA KEY        E":PRINT"TO SAVE DATA KEY       S"
30 PRINT"TO RESERVE PET KEY      W"
32 GETA$:IFA$=""GOTO32
34 IFA$="L"THENPOKE59468,14:PR=1:GOTO20
36 IFA$="I"ANDW=0THENRK=0:GOTO54
38 IFA$="R"THENPRINT"HOW MANY PAGES OF FINISHED TEXT":GOSUB4:T=VAL(DZ$):GOTO334
40 IFW=0GOTO16
42 IFA$="D"THENGOSUB250
44 IFA$="S"THENINPUT"HOW MANY PAGES TO BE SAVED";D:GOTO364
46 IFA$="E"THENGOSUB114
48 IFA$="W"THENGOSUB400
50 IFA$="P"THENGOSUB406:GOSUB180:GOTO202
52 GOTO16
54 PRINT"HOW MANY PAGES?(MAX 4 (9) FOR 60 LINE   PAGES)"
56 GETT$:T=VAL(T$):IFT$=""ORVAL(T$)=0THENGOTO56
58 PRINT"1:-"T"PAGE";:IFT>1THENPRINT"S";
60 PRINT:PRINT"HOW MANY COLUMNS? (MAX 16)":PRINT"                    1":INPUTX
62 F=INT(76/X)-RK:IFX>16THENPRINT"1111":GOTO60
64 IF(F+2)*X>78THENF=F-1:GOTO64
66 PRINT"MAX. NO. OF CHARS PER COLUMN="F
68 PRINT"HOW MANY LINES PER COLUMN? (MAX 60)
70 INPUTY:IFY>200THENPRINT"1                =========1":GOTO70
72 DIMI$(T,X,Y):DIML$(X,Y)
74 FORK=VTOT:FORR=1TOX
76 PRINT"3KEY IN DATA SEP'D BY RETURN FOR PAGE"K;TAB(70)"COLUMN"R
```

```
 78 PRINT"COMMAS & ,COLONS BY SHIFT/, & SHIFT/:     LEADING SPACE BY SHIFT/SPACE"
 80 PRINT"IF COLUMN COMPLETED BEFORE"Y"LINES THEN KEY ENDATA"
 82 PRINTF"CHARS ENDS AT THE ^
 84 G$=LEFT$(LH$,F):PRINTG$+" ^":AA=0:G$=LEFT$(H$,F):FORC=ITOY:Z$=G$
 86 IFAA=1GOTO108
 88 SD=LEN(G$)-38:SR=33727+SD
 90 PRINT"1111":POKESR,30:IFAA=0THENINPUTI$(K,R,C):P$=I$(K,R,C)
 92 GA$=LEFT$(P$,1):MV=LEN(P$):POKESR,32:SD=0
 94 IFASC(GA$)=63THENI$(K,R,C)=RIGHT$(I$(K,R,C),MV-2):MV=0:GA$=" "
 96 IFLEN(P$)<=FGOTO102
 98 PRINT"  TOO MANY CHARS, KEY AGAIN1111":IFX>1THENPRINT
 100 GOTO90
 102 IFP$="PAWES"THENC=C-1:GOSUB400
 104 FF=Y:IFP$="ENDATA"THENAA=1:FF=C:GOTO108
 106 GOTO110
 108 I$(K,R,C)=G$
 110 NEXTC:NEXTR:I=1:NEXTK:W=1
 112 GOTO16
 114 PRINT"3":FORK=1TOT:FORR=1TOX:FORC=1TOY:PRINT"PAGE"K" COLUMN"R" LINE"C"= "
 116 PRINT"":V=C:U=R:Z=C:WW=R:DD=0:EE=0:DO=0:CO=0:XX=0:CX=0
 118 V=V-1:DD=DD+1:IFDD<2THEN118
 120 IFV<=0THENU=U-1:V=Y+V:GOTO120
 122 IFU<=0THENU=1:V=1
 124 Z=Z+1:EE=EE+1:IFEE<4THEN124
 126 IFZ>YTHENWW=WW+1:Z=Z-Y:GOTO126
 128 IFWW>XTHENWW=X:Z=Y
 130 FORA=UTOWW
 132 FORB=1TOY:V$=I$(K,A,B):V$=V$+H$:V$=LEFT$(V$,76):IFX=1THENV$=LEFT$(V$,36)
 134 IFXX=0THENB=V:XX=1
 136 IFA=RANDB=CTHENPRINT"_ "V$:DO=1:GOTO142
 138 IFA=WWANDB=ZTHENB=Y:GOTO142
 140 PRINT"  "V$:IFDO=0THENCO=CO+1:IF F>40THENCO=CO+1
 142 CX=CX+1:NEXTB:NEXTA
 144 IFCX<7THENPRINTG$:CX=CX+1:GOTO144
 146 PRINT"":PRINT"EDIT?-Y OR N OR I OR D OR J OR LINE NO."
 148 INPUTC$:IF C$="J"THENC=Y:GOTO178
 150 KZ=VAL(C$):IFKZ>0THENC=KZ-1:GOTO178
 152 IFC$="N"GOTO172
 154 IFC$="Y"GOTO162
 156 IFC$="I"GOTO268
 158 IFC$="D"THENGOTO290
 160 GOTO146
 162 SP$=""
 164 IFCO>=1THENCO=CO-1:SP$=SP$+"":GOTO164
 166 PRINTSP$:INPUTD$:D$=D$+G$:GA$=LEFT$(D$,1):MV=LEN(D$):IFMV<2THENMV=2
 168 IFASC(GA$)=63THEND$=RIGHT$(D$,MV-2):MV=0:GA$=" "
 170 I$(K,R,C)=LEFT$(D$,F)
 172 FORG=RTOX:FORH=CTOY:Q$=I$(K,G,H)
 174 Q$=Q$+G$:Q$=LEFT$(Q$,F)
 176 NEXTH:NEXTG
 178 NEXTC:NEXTR:NEXTK:RETURN
 180 GOSUB386:PRINT"3LENGTH OF TEXT IS"FF"LINES":IFSQ=1GOTO192
 182 PRINT"DO YOU WISH TO AMEND THE LENGTH OF THE":K9=66-FF
 184 PRINT"FORM FEED FROM"K9"LINES";:YC=0:PRINT" (Y OR N)":GOSUB4
 186 J5=0:YB=48:IFDZ$<>"Y"THENJ5=1:GOTO192
 188 PRINT"ENTER LINES OF FORM FEED REQUIRED":INPUTYG
 190 YB=FF+YG+4
 192 GOSUB194:GOTO198
N194 PN=F:PRINT"PREPARE PRINTER":IFPR=0THENPRINT"IS COMPUTER SWITCH DOWN?":RETURN
 196 IFPR=1THENPRINT"iS COMPUTER SWITCH UP?":RETURN
 198 PRINT"ANY KEY WHEN READY TO PROCEED11":GOSUB4:PRINT"3"
 200 IFJ5=1THENYB=65
 202 L=L-1:Z5=Z6-L:IFZ5=9THENPRINT"                                                  "
 204 PRINT"PRINTING PAGE"Z5+1"OF"Z6"PAGE";:IFZ6>1THENPRINT"S";
 206 PRINT"      ":IFL>0THENGOSUB210:GOTO202
 208 GOTO16
 210 OPEN4,4:TI$="000000":IFT>1THENYB=YB+1
 212 IFPR=0THENYA=67:GOTO216
 214 IFPR=1THENYA=195:IFYC=0ANDYB>63THENYB=YB+128:YC=1
 216 PRINT£4,CHR$(27)CHR$(YA)CHR$(YB)
 218 FORK=1TOT:IFK>1THENPRINT£4,"                                   ("K")"
 220 FORC=1TOFF:Q=0:FORR=1TOX:R$=I$(K,R,C):R$=R$+G$:R$=LEFT$(R$,F)
 222 IA$="DUBBLE"+G$:IA$=LEFT$(IA$,F):IFR$=IA$GOTO310
 224 IB$="MINNI"+G$:IB$=LEFT$(IB$,F):IFR$=IB$GOTO318
 226 IC$="BOLED"+G$:IC$=LEFT$(IC$,F):IFR$=IC$GOTO326
 228 ID$="OVPR"+G$:ID$=LEFT$(ID$,F)
 230 Q=Q+1:IFPR=1THENPRINT£4,CHR$(18)CHR$(155)CHR$(200)R$"  ";
 232 IFPR=0THENPRINT£4,CHR$(18)CHR$(27)CHR$(72)R$"  ";
 234 PN=F:TT=R+1:QQ=C:IFTT>XTHENTT=1:QQ=C+1:IFQQ>YTHENQQ=Y:TT=X
 236 J$=I$(K,TT,QQ):IFJ$=ID$ORJ$="OVPR"THENR=R+1:GOSUB372
 238 IFJ$=ID$ORJ$="OVPR"THENPRINT£4," ";:GOTO244
 240 IFQ<XGOT,O244
 242 PRINT£4
 244 NEXTR:NEXTC
```

```
246 PRINT£4,CHR$(12):NEXTK:PRINT"PRINTING TIME IS"VAL(TI$)"SECS. ":CLOSE4
248 RETURN
250 PRINT"3"
252 FORK=1TOT:FORR=1TOX:PRINT"PAGE"K"   COLUMN"R"   KEY J OR P":FORC=1TOY
254 U$=I$(K,R,C):U$=U$+H$:U$=LEFT$(U$,80):P=0:IFX>1THENU$=LEFT$(U$,40)
256 PRINTU$
258 P=P+2:IFP<150/X+50 GOTO258
260 GETDW$:IFDW$=""THEN266
262 IFASC(DW$)=74THENC=Y
264 IFASC(DW$)=80THENPRINT"WAITING2   PRESS ANY KEY TO CONTINUE1":GOSUB4
266 NEXTC:NEXTR:PRINT"ANY KEY WHEN READY TO PROCEED":GOSUB4:NEXTK:RETURN
268 M=C:N=R:NM=0:FF=FF+1:IFFF>YTHENFF=Y
270 QW=C:FORO=RTOX:FORS=CTOY:L$(O,S)=I$(K,O,S):NEXTS:C=1:NEXTO
272 C=QW:I$(K,R,C)=G$:O=N-1
274 O=O+1
276 S=M:IFM=YTHENM=0:IFNM=0THENN=N+1
278 M=M+1:I$(K,N,M)=L$(O,S)
280 IFM=YTHENN=O+1:NM=1
282 IF(O=X)AND(M=Y)THEN116
284 IFS<YGOTO276
286 S=1:IFO<XGOTO274
288 GOTO116
290 M=C:N=R:S=C:O=R
292 M=S:IFS=0THENM=Y
294 S=S+1:IFS>YTHENS=S-Y:O=O+1
296 IF(N=X)AND(M=Y)GOTO306
298 L$(N,M)=I$(K,O,S):IFM=YTHENN=N+1
300 IFS<YGOTO292
302 O=O+1:S=0:IFN<=XGOTO292
304 GOTO116
306 L$(N,M)=G$:WQ=C:FORN=RTOX:FORM=CTOY:I$(K,N,M)=L$(N,M)
308 NEXTM:C=1:NEXTN:C=WQ:GOTO116
310 PN=INT(PN/2):R=R+1:IFR>XTHENR=1:C=C+1:IFC>YTHENC=Y:R=X
312 N$=I$(K,R,C):N$=LEFT$(N$,PN)
314 IFPR=0THENPRINT£4,CHR$(18)CHR$(27)CHR$(72)CHR$(14)N$" ";:GOTO332
316 IFPR=1THENPRINT£4,CHR$(18)CHR$(155)CHR$(200)CHR$(14)N$" ";:GOTO332
318 PN=INT(PN*1.65):R=R+1:IFR>XTHENR=1:C=C+1:IFC>YTHENC=Y:R=X
320 M$=I$(K,R,C):M$=LEFT$(M$,PN)
322 IFPR=0THENPRINT£4,CHR$(27)CHR$(72)CHR$(15)M$" ";:GOTO332
324 IFPR=1THENPRINT£4,CHR$(155)CHR$(200)CHR$(15)M$" ";:GOTO332
326 R=R+1:IFR>XTHENR=1:C=C+1:IFC>YTHENC=Y:R=X
328 IFPR=1THENPRINT£4,CHR$(18)CHR$(155)CHR$(199)I$(K,R,C)"  ";
330 IFPR=0THENPRINT£4,CHR$(18)CHR$(27)CHR$(71)I$(K,R,C)"  ";
332 Q=Q+1:GOTO234
334 PRINT"PREPARE TAPE     KEY SPACE":GOSUB4
336 PRINT"OPEN FILE":OPEN1,1,0,"DATA":PRINT"3"
338 INPUT£1,D:INPUT£1,X:INPUT£1,Y:PRINTT"PAGES      "X"COLUMNS     "Y"LINES
Y340 POKE59411,61:PRINT"IS"Y"LINES OK?":GOSUB4:IFDZ$="N"THENINPUT"NO. OF LINES";Y
342 DIMI$(T,X,Y):DIML$(X,Y):FORK=1TOD:FORR=1TOX:FORC=1TOY:INPUT£1,I$(K,R,C)
344 O$=I$(K,R,C):PRINTO$:NEXTC:NEXTR:NEXTK:INPUT£1,SQ:INPUT£1,Z$
346 PRINT"CLOSE FILE":CLOSE1:PRINT"CLOSED"
4348 POKE59411,53:W=1:F=INT(76/X):G$=LEFT$(H$,F):PRINT"ANY KEY TO PROCEED":GOSUB4
350 IFX<>1THEN360
352 PRINT"3DO YOU WISH TO CONTINUE INPUTTING DATA  ONTO YOUR LAST PAGE";
354 PRINT" KEY Y OR N":GOSUB4
356 IFDZ$="N"THEN360
358 KK=D:LG=1:GOSUB390:I=1+I:V=D:GOTO74
360 IFT>DTHENV=D+1:GOTO74
362 GOTO16
364 PRINT"3PREPARE TAPE     KEY SPACE":GOSUB4
366 PRINT"OPEN FILE":OPEN1,1,2,"DATA":PRINT£1,D:PRINT£1,X:PRINT£1,Y
368 FORK=1TOD:FORR=1TOX:FORC=1TOY:PRINT£1,I$(K,R,C):PRINTI$(K,R,C)
370 NEXTC:NEXTR:NEXTK:PRINT£1,SQ:PRINT£1,Z$:PRINT"CLOSING FILE":CLOSE1:GOTO16
372 IFR>XTHENR=1:C=C+1:IFC>YTHENR=X:C=Y
374 RETURN
376 IFPR=1GOTO380
378 IFASC(QH$)=13ORJS=0THENPRINT£4,CHR$(27)CHR$(72)CHR$(20);:GOTO382
380 IFASC(QH$)=13ORJS=0THENPRINT£4,CHR$(155)CHR$(200)CHR$(20);
382 RETURN
384 FORJH=1TO20:NEXTJH:RETURN
386 FF=0:IFX<>1THENFF=Y:RETURN
388 FORKK=1TOT
390 FORI=YTO1STEP-1:IFI$(KK,1,I)=Z$THENNEXTI
392 IFLG=1THENLG=0:RETURN
394 IFI>=FFTHENFF=I:NEXTKK
396 RETURN
398 PRINT£4,CHR$(9)XA$:PRINT£4,CHR$(9)XB$
400 PRINT"3WORD PROCESS DATA STORED IN PROGRAM.
402 PRINT"PLEASE DO NOT TOUCH.":GOSUB4:PRINT".":OPEN4,4:PRINT£4:CLOSE4
404 PRINT"3":RETURN
406 PRINT"DO YOU WANT MORE THAN ONE COPY ?":GOSUB4
408 L=2:Z6=1:IFDZ$="Y"THENPRINT"HOW MANY ";:INPUTL:L=L+1:Z6=L-1
410 RETURN
READY.
```

BASIC PROGRAMMING

Our collection of Basic programs for the Commodore family of machines attempts, each month, to cover as many different software areas for each computer as possible. From utilities to games, you'll find them all in here every month.

Obviously, we can't feature all that we'd like to. More importantly, we can't feature everything that you'd like us to! The only way this situation can be improved, is by you, the reader. Tell us what you think. Do you want more games, more utilities, more business programs? Write and let us know, because until you do…

The quality of the software reproduced here also depends, to a large extent, on you. If you've written a marvellous routine, let us know about it.

Petman

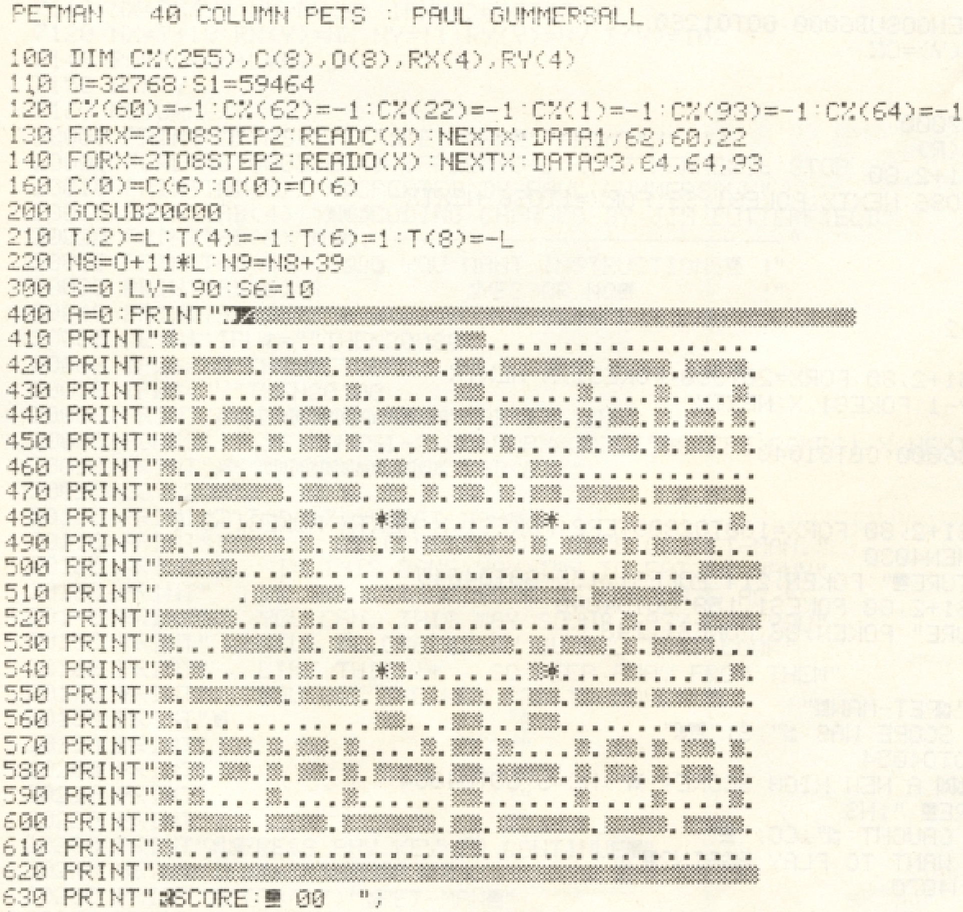
Our first program this month is a game for all Commodore 40 column PETs, and with a little bit of work for Commodore 64 owners as well. It is a version of that well-known arcade game Pacman, in which you have to race around the screen gobbling up little dots while avoiding the pursuing aliens.

The program uses conventional CB2 sound on the PET, and this is one of the areas that will have to be changed if you want the program to work on your Commodore 64. The variable used to control the sound is defined in line number 110 (S1 = 59464), but unfortunately we can't just change this and have it working on a 64 straight away.

Sound is produced in line numbers 110, 1290, 1300, 1310, 2020, 2030, 4002, 4020, 4025, 4030, 4044, 6012, 7080, 7090 and 20085. These will have to be altered for 64 people. Of course, you could have the game without any sound at all, and just have these as REM statements.

The only other variable that you'll have to change is also in line 110, and this is the variable O, which is set to 32768, the start of screen memory for PETs. Changing this to 1024, screen memory start on the 64, should sort any problems out.

This also illustrates a useful programming technique. Do not have your listing riddled with numbers for screen POKEing, note playing, but have a variable at the start of the program, as in line 110 here, which is then altered as the program progresses. It makes program alterations a lot easier!



```
PETMAN   40 COLUMN PETS : PAUL GUMMERSALL

100 DIM C%(255),C(8),O(8),RX(4),RY(4)
110 O=32768:S1=59464
120 C%(60)=-1:C%(62)=-1:C%(22)=-1:C%(1)=-1:C%(93)=-1:C%(64)=-1
130 FORX=2TO8STEP2:READC(X):NEXTX:DATA1,62,60,22
140 FORX=2TO8STEP2:READO(X):NEXTX:DATA93,64,64,93
160 C(0)=C(6):O(0)=O(6)
200 GOSUB20000
210 T(2)=L:T(4)=-1:T(6)=1:T(8)=-L
220 N8=O+11*L:N9=N8+39
300 S=0:LV=.90:S6=10
400 A=0:PRINT"J▚▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
410 PRINT"▒..................▒▒..................
420 PRINT"▒.▒▒▒▒.▒▒▒▒.▒▒▒▒▒▒.▒▒.▒▒▒▒▒▒.▒▒▒▒.▒▒▒▒.
430 PRINT"▒.▒....▒....▒......▒▒......▒....▒....▒.
440 PRINT"▒.▒.▒▒.▒.▒▒.▒.▒▒▒▒.▒▒.▒▒▒▒.▒.▒▒.▒.▒▒.▒.
450 PRINT"▒.▒.▒▒.▒.▒▒.▒....▒.▒▒.▒....▒.▒▒.▒.▒▒.▒.
460 PRINT"▒.............▒▒...▒▒...▒▒.............
470 PRINT"▒.▒▒▒▒▒▒.▒▒▒▒.▒▒.▒.▒▒.▒.▒▒.▒▒▒▒.▒▒▒▒▒▒.
480 PRINT"▒.▒......▒....*▒........▒*....▒......▒.
490 PRINT"▒...▒▒▒▒.▒.▒▒▒.▒.▒▒▒▒▒▒.▒.▒▒▒.▒.▒▒▒▒...
500 PRINT"▒▒▒▒▒....▒...................▒....▒▒▒▒▒
510 PRINT"     .▒▒▒▒▒▒.▒▒▒▒▒▒▒▒▒▒▒▒▒.▒▒▒▒▒▒.
520 PRINT"▒▒▒▒▒....▒...................▒....▒▒▒▒▒
530 PRINT"▒...▒▒▒▒.▒.▒▒▒.▒.▒▒▒▒▒▒.▒.▒▒▒.▒.▒▒▒▒...
540 PRINT"▒.▒......▒....*▒........▒*....▒......▒.
550 PRINT"▒.▒▒▒▒▒▒.▒▒▒▒.▒▒.▒.▒▒.▒.▒▒.▒▒▒▒.▒▒▒▒▒▒.
560 PRINT"▒.............▒▒...▒▒...▒▒.............
570 PRINT"▒.▒.▒▒.▒.▒▒.▒....▒.▒▒.▒....▒.▒▒.▒.▒▒.▒.
580 PRINT"▒.▒.▒▒.▒.▒▒.▒.▒▒▒▒.▒▒.▒▒▒▒.▒.▒▒.▒.▒▒.▒.
590 PRINT"▒.▒....▒....▒......▒▒......▒....▒....▒.
600 PRINT"▒.▒▒▒▒.▒▒▒▒.▒▒▒▒▒▒.▒▒.▒▒▒▒▒▒.▒▒▒▒.▒▒▒▒.
610 PRINT"▒..................▒▒..................
620 PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
630 PRINT"▚SCORE:▆ 00  ";
640 NX=39:FORNY=0TO22:IFNY<>11THENPOKEO+NX+L*NY,102
650 NEXTNY
```

```
660 ZX=88:FORY=1TO4
670 NX=INT(RND(1)*37+2)
680 NY=INT(RND(1)*21+2)
690 Z=O+NX+L*NY:IFPEEK(Z)<>46GOTO670
700 B(Y)=PEEK(Z):POKEZ,ZX
710 RX(Y)=NX:RY(Y)=NY
720 NEXTY
730 N=O+L+1:N0=N:POKEN,C(6)
1000 GETR$:IFR$=""GOTO1040
1010 R1=ASC(R$)-48:IFR1<2ORR1>8GOTO1000
1020 IFT(R1)=0GOTO1000
1030 R=R1:R2=T(R)
1040 N0=N+R2
1050 N1=PEEK(N0)
1060 IFN0=N8THENN0=N0+38:GOTO1050
1070 IFN0=N9THENN0=N0-38:GOTO1050
1080 IFN1=102THENN0=N:N1=32
1090 IFN1=42THENGOSUB5000
1100 IFN1=46THENS=S+5:A=A+1:GOSUB25000
1110 IFN1=88GOTO4000
1120 IFN1=216THENGOSUB5800:GOTO1040
1130 S8=66:IFN1=46THENS8=125
1160 S9=S8:Q=N-O:PY=INT(Q/L):PX=Q-PY*L
1170 FORY=1TO4
1180 IFRND(1)<LVGOTO1260
1190 RX=RX(Y):IFRX=0GOTO1260
1200 NX=RX+SGN(PX-RX):NY=RY(Y)+SGN(PY-RY(Y))
1210 Z=O+NX+L*NY:C%=PEEK(Z):IFC%=ZXGOTO1260
1220 POKEO+RX(Y)+L*RY(Y),B(Y):B(Y)=32
1225 IFC%(C%)GOTO3950
1230 IFZ=N0ANDZX=216THENGOSUB6000:GOTO1260
1240 POKEZ,ZX:S9=253:B(Y)=C%
1250 RX(Y)=NX:RY(Y)=NY
1260 NEXTY
1270 IFZX=216THENGOSUB7000
1280 POKEN,32:POKEN0,C(R)
1290 POKES1+3,16:POKES1+2,80
1300 POKES1,S8:FORX=1TOS6:NEXTX:POKES1,S9:FORX=1TOS6:NEXTX
1310 POKES1+3,0
1320 POKEN0,O(R)
1330 N=N0
1340 IFA<>448GOTO1000
2000 LV=LV*LV:S6=S6/2+2
2010 F=F+1
2020 POKES1+3,16:POKES1+2,80:FORX=20TO50:POKES1,X:NEXTX
2030 FORX=250TO220STEP-1:POKES1,X:NEXTX
2040 GOTO400
3950 IFZX=216THENGOSUB6000:GOTO1040
3999 REM SUICIDE
4000 FORK=1TO10
4002 POKES1+3,16:POKES1+2,80:FORX=180TO230STEP2:POKES1,X:NEXTX:POKES1+3,0
4010 IFK/2<>INT(K/2)THEN4030
4020 PRINT"■■■■■■CAPTURE■":POKEN,214:POKES1,158:GOTO4040
4025 POKES1+3,16:POKES1+2,80:POKES1,158:GOTO4040
4030 PRINT"■■■■■■CAPTURE":POKEN,86:POKES1,248
4040 NEXTK
4044 POKES1+3,0
4045 PRINT"■"TAB(19);"■PET-MAN■"
4050 PRINT"■■■■■YOUR SCORE WAS ■";S;"■■"
4051 IFHS=0THENHS=S:GOTO4054
4052 IFS>HSTHENPRINT"■■ A NEW HIGH SCORE! ■":HS=S:GOTO4054
4053 PRINT"■ HIGH SCORE■:";HS
4054 PRINT"■■■■GUARDS CAUGHT:■";CG;"■"
4060 PRINT"■■■■DO YOU WANT TO PLAY AGAIN?■"
4070 GETW$:IFW$=""THEN4070
4080 IFW$="N"THENEND
4090 IFW$<>"Y"THEN4070
```

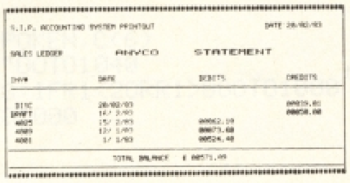
```
4100 GOTO300
4999 REM EAT A PILL
5000 ZX=216:FORY=1TO4
5010 NX=RX(Y):NY=RY(Y):IFNX=0GOTO5030
5020 POKEO+NX+L*NY,ZX
5030 NEXTY
5035 T0=TI+600
5040 RETURN
5799 REM CHOMP A GHOST
5800 FORY=1TO4:IFN0=RX(Y)+RY(Y)*L+OGOTO5830
5820 NEXTY:STOP
5830 POKEN0,B(Y)
5999 REM: WIPE A GHOST
6000 S=S+100
6005 GOSUB25000
6010 CG=CG+1
6012 POKES1+3,16:POKES1+2,80:FORX=10TO100STEP2:POKES1,X:NEXTX:POKES1+2,0
6016 RX(Y)=0
6060 RETURN
7000 IFTI>T0GOTO7100
7010 IFT0-TI>60GOTO7160
7020 FORY=1TO4
7030 RX=RX(Y):IFRX<>0GOTO7070
7040 NX=Y+18:NY=11:Z=O+NX+L*NY:IFPEEK(Z)=88GOTO7060
7050 POKEZ,88:GOTO7070
7060 POKEZ,102
7070 NEXTY
7080 POKES1+3,16:POKES1+2,80:FORX=20TO50:POKES1,90-X:NEXTX
7090 POKES1+3,0:RETURN
7100 ZX=88:FORY=1TO4
7110 NX=RX(Y):NY=RY(Y):IFNX<>0GOTO7140
7120 NX=Y+18:RX(Y)=NX:NY=11:RY(Y)=NY:B(Y)=102
7140 POKEO+NX+L*NY,ZX
7150 NEXTY
7160 RETURN
20000 PRINT"⊐"TAB(17);"▚PET-MAN▀":PRINT"/"
20001 FORL=40TO80STEP40:IFPEEK(O+L)<>47THENNEXTL:STOP
20010 PRINTTAB(7);"▼▼CREATED BY PAUL GUMMERSALL"
20015 PRINTTAB(4);"▼▼▼CODING CHANGES BY JIM BUTTERFIELD"
20020 PRINTTAB(6)"▼▼▼┌──────────────────────────┐"
20030 PRINTTAB(6)"| ▚DO YOU WANT INSTRUCTIONS▀ |"
20035 PRINTTAB(6)"|          ▚YES OR NO▀       |"
20040 PRINTTAB(6)"└──────────────────────────┘"
20050 GETW$:IFW$=""THEN20080
20060 IFW$="N"THENRETURN
20070 IFW$="Y"THEN20100
20080 PRINT"▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲"TAB(6);"▚                             ▀"
20085 POKES1+3,16:POKES1+2,80:FORX=20TO150STEP5:POKES1,X:NEXTX:POKES1+3,0
20090 PRINT"▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲▲"TAB(6);"                             "
20095 GOTO20050
20100 PRINT"⊐"TAB(17);"▚PET-MAN▀"
20110 PRINT"▼▼▼       WELCOME TO THE GAME OF PET-MAN."
20120 PRINT"▼   IN THIS GAME YOU TRY TO EAT AS MANY"
20130 PRINT"   OF THE LITTLE DOTS IN THE MAZE AS "
20140 PRINT"   YOU CAN. THIS MAY SOUND EASY BUT YOU"
20150 PRINT"   WILL BE CHASED BY GUARDS THAT LOOK"
20160 PRINT"   LIKE THIS; ♣ , SO KEEP AWAY FROM THEM"
20170 PRINT"   YOU USE THE KEY PAD TO MOVE: "
20180 PRINT"▼                  8"
20190 PRINT"                   |"
20200 PRINT"                 4-+-6"
20210 PRINT"                   |"
20220 PRINT"                   2"
20230 PRINT"▼▚PRESS ANY KEY TO CONTINUE▀"
20240 GETW$:IFW$=""THEN20240
20250 PRINT"⊐"TAB(17)"▚PET-MAN▀"
20260 PRINT"▼▼   YOU HAVE A CHANCE OF CAPTURING THE"
20270 PRINT"   GUARDS. YOU HAVE TO EAT ONE OF THE"
```

NEW

For VIC 20 and CBM 64 Users

SIP ACCOUNTING SYSTEM

Highly comprehensive program designed for 16K, 24K, VIC20 & Printer, 40 col VIC20, CBM 64. Makes an ideal introduction for you and your staff to the world of computer accounts.


ANYCO
STATEMENT

Features include:
- Menu driven – simplicity to use!
- Up to 250 accounts per tape
- Day book
- Sales and purchase ledger (or just 1 type)
- Statements print (for all or just one company)
- Overdue account statements (as above)
- End period carry on to next data tape
- Cash summary – debitors and creditors
- VAT entry (net or gross)
- PLUS many, many more features – all in ONE program.

Program specification:
SIP/AC 20 – 16K (approximately 130 invoices per data tape)
SIP/AC 20 – 24K (approximately 350 invoices per data tape)
SIP/AC 40 – 40col + 24K + 3K (approximately 430 invoices per data tape)
SIP/AC 64 – CBM64 (approximately 650 invoices per data tape)
Note: printer required for all programs.

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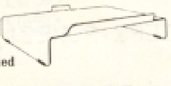

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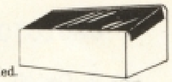

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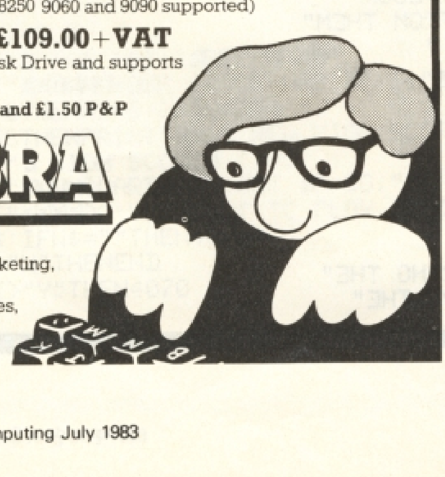

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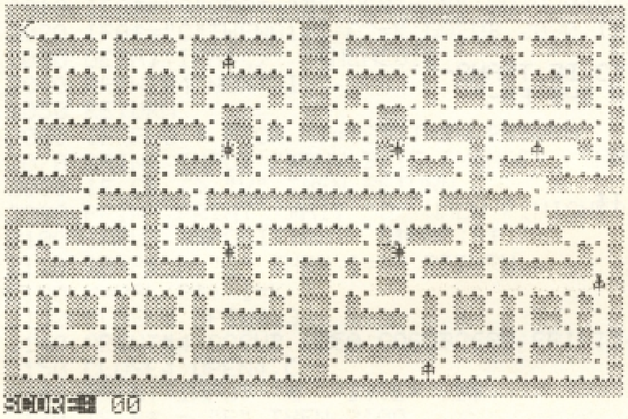
```
 20280 PRINT"    ENERGIZERS THAT LOOK LIKE THIS: *"
 20285 PRINT"    WHEN YOU DO, THE GUARDS APPEAR
 20290 PRINT"    IN REVERSE.  NOW YOU CAN GET THEM
 20295 PRINT"    AND GAIN 100 POINTS EACH.
 20296 PRINT
 20297 PRINT"    BUT WATCH IT:  THE ENERGIZERS LAST
 20300 PRINT"    ONLY TEN SECONDS; THEN THE
 20301 PRINT"    GUARDS ARE BACK AND DANGEROUS.
 20310 PRINT"████ARE YOU READY TO PLAY█"
 20320 GETW$:IFW$=""THEN20320
 20330 IFW$="Y"THENRETURN
 20340 IFW$<>"N"THEN20320
 20350 PRINT"████████████████WELL DECIDE"
 20351 FORX=1TO200:NEXTX
 20355 PRINT"████████████████           "
 20360 GOTO20320
 25000 PRINT"███████████████████████████SCORE:█";S;:RETURN
READY.
```



Disk Recover

A most useful program for any Commodore user with disk drives. We've all encountered, at one time or another, the dreaded message READ ERROR. The two tracks on the disk that are most prone to this are track numbers 23 and 24 : these are the most commonly accessed.

This program will recover any data that has been lost as a result of read errors on either of the above two tracks. We don't guarantee that it will work 100% of the time, but the success rate definitely makes it worth typing in. This month's Know How section would have been a lot shorter without this program!

Its use however is not only confined to these two tracks. Errors elsewhere can also be dealt with. If this program doesn't work your disk is probably beyond redemption.

```
DISK RECOVER! : ANYTHING WITH DISKS! : S. HARRIS

 1000 REM ************************************
 1010 REM *   THIS PROGRAM WILL RECOVER MOST *
 1020 REM * OF THE DATA ON A DISKKETTE WHEN  *
 1030 REM * DOS ENCOUNTERS A 23 OR 24 READ   *
 1040 REM * ERROR.                           *
 1050 REM * ANY ERROR OTHER THAN 23 OR 24    *
 1060 REM * WILL CAUSE THE PREVIOUS SECTOR   *
 1070 REM * TO BE WRITTEN.                   *
 1080 REM *                                  *
 1090 REM * BY    S. HARRIS                  *
 1100 REM *                                  *
 1110 REM * VERSION 15   10-25-80  BOB F.    *
 1120 REM * VERSION 16   03-06-81  BOB F.    *
 1130 REM ************************************
 1140 PRINT"█"
```

```
1150 DIM CH$(8)
1160 HX$ = "0123456789ABCDEF"
1170 C = 3:PRINT:INPUT "▒TO PRINTER   N████";A$
1180 IF A$ = "Y" THEN C = 4
1190 OPEN 4,C
1200 OPEN 15,8,15
1210 PRINT"▒▒WHAT DISK SYSTEM DO YOU HAVE ?"
1220 PRINT"DOS 1.0 2040         =1"
1230 PRINT"DOS 2.0 2040 (4040) =2"
1240 PRINT"DOS 2.5 8050         =3"
1250 INPUT "▒DISK SYSTEM  =    2████";D
1260 IF D<1 OR D>3 THEN PRINT"▒▒";:GOTO1250
1270 IFD>2THEN:FORI=1TO10:READT:NEXT
1280 IFD>1THEN:FORI=1TO10:READT:NEXT
1290 INPUT "▒▒   FROM DRIVE    0████";SD
1300 INPUT "▒▒     TO DRIVE    0████";DD
1310 INPUT "▒▒DO YOU WISH TO TRACE A FILE   Y████";F$
1320 IF F$ <> "Y" THEN 1370
1330 INPUT "▒FILE NAME";NM$
1340 GOSUB 2310
1350 IF TRK = 0 THEN 1690
1360 GOSUB 2640:FLG = 1:T$ = "Y":GOTO 1470
1370 PRINT "▒▒▒INPUT THE TRACK AND SECTOR TO BE TRANS-"
1380 PRINT "FERED.  A 0 FOR TRACK WILL COPY THE EN-"
1390 INPUT "TIRE DISK";T,S
1400 IF T=0 THEN1450
1410 TRK = T:SEC = S:FLG = 1
1420 INPUT "▒DO YOU WISH TO TRACE    N████";T$
1430 IFT$<>"Y"THENZ$="Y":GOTO1480
1440 GOSUB2640:GOTO1480
1450 T=1:S=0:FLG=0
1460 READ TRK,SEC
1470 IFTRK=0THEN1700
1480 FORT=TTOTRK
1490 : FOR S = S TO SEC
1500 :    GOSUB 1740
1510 :    CM = 11*16+DD     :REM SEEK FOR ID ON DRIVE
1520 :    GOSUB 2660        :REM EXECUTE CMD
1530 :    GOSUB 2920        :REM WAIT TILL DONE
1540 :    GOSUB 2570        :REM CHECK FOR DIRECTORY HEADER FOR ID CHANGE
1550 :    GOSUB 1830        :REM CHECK FOR BLOCK VIEW
1560 :    IF Z$ <> "Y" THEN 1580
1565 :    IFW$="Q"THEN GOTO1580
1570 :    GOSUB 2060        :REM ASK FOR BYTE CHANGES
1580 :    GOSUB 2890        :REM WRITE TRACK, SECTOR TO WRITE
1590 :    CM = 9*16+DD      :REM WRITE COMMAND ON DRIVE
1600 :    GOSUB 2660        :REM EXECUTE CMD
1610 :    GOSUB 2920        :REM WAIT TILL DONE
1620 :    GOSUB 2230
1630 :    IF T$="Y" THEN 1470
1640 : NEXT S
1650 IF FLG THEN 1700
1660 S = 0
1670 NEXT T
1680 GOTO 1460
1690 PRINT "▒FILE /";NM$;"/ NOT FOUND"
1700 CLR:RESTORE:GOTO 1160
1710 T1 = INT(N/16):H$=MID$(HX$,T1+1,1)
1720 T2 = INT(N-16*T1):H$=H$+MID$(HX$,T2+1,1)
1730 H$=H$+" ":RETURN
1740 GOSUB 2890          :REM WRITE TRACK TO SEEK
1750 CM = 11*16+SD       :REM SEEK FOR ID ON DRIVE
1760 GOSUB 2660          :REM EXECUTE CMD
1770 GOSUB 2920          :REM WAIT TILL DONE
1780 GOSUB 2890          :REM WRITE TRACK, SECTOR TO READ
1790 CM = 8*16+SD        :REM READ COMMAND ON DRIVE
1800 GOSUB 2660          :REM EXECUTE CMD
1810 GOSUB 2920          :REM WAIT TILL DONE
```

BASIC PROGRAMMING

```
1820 RETURN
1830 REM************************************
1840 IF FLG = 0 THEN RETURN
1850 IFZ$="N"THENPRINT#4,"FILE TRACE";T;S:RETURN
1860 PRINT#4:PRINT#4,"VIEWING TRACK";T;" SECTOR";S:PRINT#4
1865 IFW$="Q"THEN RETURN
1870 INPUT "▒▒DO YOU WISH TO VIEW THE BLOCK(Y,N,Q)   Y▌▌▌";W$
1880 IFW$="Q"THEN RETURN
1890 IFW$<>"Y"THENRETURN
1900 PRINT "▒HIT ▒SPACE▌ TO HALT/RESTART, ▒S▌ TO QUIT,"
1910 PRINT "OR ▒C▌ TO CHANGE BYTES"
1920 K = 0
1930 FOR I = 0 TO 255 STEP 8
1940 GOSUB 2850
1950 GOSUB 2680
1960 PRINT#4," ";
1970 GOSUB 2810
1980 GETA$:IFA$=""THEN2040
1990 IFA$=" "THEN2030
2000 IFC=4THENPRINT#4
2010 IFA$="S"ORA$="D"THENI=255:GOTO2040
2020 IFA$="C"THENG1=I:G2=K:GOSUB 2090:I=G1:K=G2:GOTO 2040
2030 GETA$:IFA$<>" "THEN2010
2040 PRINT#4:NEXT I
2050 RETURN
2060 IF FLG = 0 OR A$="S" THEN RETURN
2070 PRINT:INPUT "▒ANY BYTE CHANGES   N▌▌▌";C$
2080 IF C$ <> "Y" THEN RETURN
2090 PRINT:PRINT "▒HIT 'Q' WHEN FINISHED"
2100 INPUT "▒POSITION   Q▌▌▌";P$
2110 IF P$ = "Q" THEN I=TM:RETURN
2120 K=VAL(P$):I=K
2130 CLOSE4:OPEN4,3
2140 PRINT#4:GOSUB 2850:GOSUB2680:PRINT#4," ";:GOSUB 2810
2150 CLOSE4:OPEN4,C
2160 PRINT:INPUT "▒   BYTE=";B$
2170 IF B$ = "E" THEN 2100
2180 NB = VAL(P$)
2190 IF LEFT$(B$,1)="$"THEN GOSUB 2960:GOTO 2210
2200 TP=VAL(B$)
2210 PRINT#15,"M-W"CHR$(NB)CHR$(18)CHR$(1)CHR$(TP)
2220 GOTO 2100
2230 IF T$<>"Y" THEN RETURN
2240 PRINT#15,"M-R"CHR$(0)CHR$(18)
2250 GET#15,A$:A$=A$+CHR$(0)
2260 T = ASC(A$):TRK = T
2270 PRINT#15,"M-R"CHR$(1)CHR$(18)
2280 GET#15,A$:A$=A$+CHR$(0)
2290 S = ASC(A$):SEC = S
2300 RETURN
2310 IFD=3THEN T=39:S=1:GOTO2330
2320 T = 18:S = 1
2330 GOSUB 1740
2340 FOR N = 5 TO 229 STEP 32
2350 : R$ = ""
2360 : FOR M = 0 TO 15
2370 :    PRINT#15,"M-R"CHR$(N+M)CHR$(18)
2380 :    GET#15,A$:A$ = A$ + CHR$(0)
2390 :    IF ASC(A$) = 160 THEN 2420
2400 :    IF ASC(A$) = 0 THEN 2440
2410 :   R$ = R$ + LEFT$(A$,1)
2420 : NEXT M
2430 : IF R$ = NM$ THEN 2480
2440 NEXT N
2450 GOSUB 2240
2460 IF TRK <> 0 THEN 2330
2470 RETURN
2480 N = N-2
```

```
2490 PRINT#15,"M-R"CHR$(N)CHR$(18)
2500 GET#15,A$:A$=A$+CHR$(0)
2510 T=ASC(A$):TRK=T
2520 N = N+1
2530 PRINT#15,"M-R"CHR$(N)CHR$(18)
2540 GET#15,A$:A$=A$+CHR$(0)
2550 S=ASC(A$):SEC=S
2560 RETURN
2570 IF T <> 18 OR S <> 0 THEN RETURN
2580 FOR I = 0 TO 1
2590 PRINT#15,"M-R"CHR$(41+I)CHR$(16)
2600 GET#15,A$:A$ = A$ + CHR$(0)
2610 PRINT#15,"M-W"CHR$(162+I)CHR$(18)CHR$(1)CHR$(ASC(A$))
2620 NEXT I
2630 RETURN
2640 PRINT:INPUT "█WILL YOU WANT TO VIEW ANY BLOCKS   Y███";Z$
2650 RETURN
2660 PRINT#15,"M-W"CHR$(4)CHR$(16)CHR$(1)CHR$(CM)
2670 RETURN
2680 FOR J = 0 TO 7
2690 PRINT#15,"M-R"CHR$(K)CHR$(18)
2700 GET#15,A$:A$ = A$ + CHR$(0)
2710 N = ASC(A$):GOSUB 1710
2720 IF(N>31ANDN<96ANDN<>34)OR(N>191ANDN<219)THENCH$(J)=A$:GOTO2740
2730 CH$(J) = "."
2740 PRINT#4,H$;
2750 K = K + 1
2760 IF K > 255 THEN 2790
2770 NEXT J
2780 J=J-1
2790 U = J
2800 RETURN
2810 FOR J = 0 TO U
2820 PRINT#4,CH$(J);
2830 NEXT J
2840 RETURN
2850 IF I < 10 THEN PRINT#4,"  █";I;"█: ";:GOTO 2880
2860 IF I < 100 THEN PRINT#4," █";I;"█: ";:GOTO 2880
2870 PRINT#4,"█";I;"█: ";
2880 RETURN
2890 PRINT#15,"M-W"CHR$(43)CHR$(16)CHR$(2)CHR$(T)CHR$(S)
2900 PRINT#15,"M-W"CHR$(19)CHR$(16)CHR$(1)CHR$(T)
2910 RETURN
2920 PRINT#15,"M-R"CHR$(4)CHR$(16)
2930 GET#15,A$:A$=A$+CHR$(0)
2940 IF ASC(A$) > 127 THEN 2920
2950 RETURN
2960 S$=MID$(B$,2,1)
2970 IF ASC(S$)>64THEN TP=(ASC(S$)-55)*16:GOTO 2990
2980 TP=VAL(S$)*16
2990 S$=MID$(B$,3,1)
3000 IF ASC(S$)>64THEN TP=TP+ASC(S$)-55:RETURN
3010 TP=TP+VAL(S$):RETURN
3020 DATA 17,20,24,19,30,17,35,16,0,0:REM 2040
3030 DATA 17,20,24,18,30,17,35,16,0,0:REM 4040
3040 DATA 39,28,53,26,64,24,77,22,0,0:REM 8050
READY.
```

BASIC PROGRAMMING

Sequential Read/Write

Another program for any Commodore user with a disk unit. This is essentially a demonstration program for those of you who are just getting to grips with writing files (other than program ones) to disk.

The program is heavily REMarked, which should make it easy enough to follow. It simply writes and reads a test file to and from the disk, and should give you more than enough help to start writing filing programs of your own.

```
SEQUENTIAL READ/WRITE : THE UNKNOWN AUTHOR : ANY PET WITH DISKS

READY.

  1 REM ***********************
  2 REM *      EXAMPLE        *
  3 REM *  READ AND WRITE A   *
  4 REM *  SEQUENTIAL DATA    *
  5 REM *  FILE USING DRIVE 0 *
  9 REM ***********************
  10 PRINT"]3INITIALIZE DISK"
  20 DIMA$(25):REM                    SET A$ ARRAY
  30 DIMB(25):REM                     SET B ARRAY
  40 OPEN15,8,15:REM                  OPEN THE COMMAND CHANNEL
  50 PRINT#15,"I0":REM                INITIALIZE DRIVE ZERO
  60 GOSUB 1000:REM                   READ THE ERROR CHANNEL
  70 CR$=CHR$(13):REM                 SET STRING CR$ TO A CARRIAGE RETURN
  90 PRINT"3WRITE TEST FILE"
  100 REM ***********************
  101 REM *                     *
  102 REM *   WRITE TEST FILE   *
  103 REM *                     *
  105 REM ***********************
  110 OPEN2,8,2,"@0: TEST FILE ,S,W":REM OPEN LOGICAL FILE 2 ON DISK 8 TO
  111 REM                            CHALLEL 2 REPLACE DATA FILE NAMED
  112 REM                            TEST FILE WITH SEQUENTIAL WRITE
  115 GOSUB 1000:REM                 READ THE ERROR CHANNEL
  120 INPUT"A$,B";A$,B:REM           INPUT NAME, NUMBER INTO A$ AND B
  130 IFA$="END"THEN 160:REM         STOP THE DATA INPUT
  140 PRINT#2,A$","STR$(B)CR$;:REM   PRINT TO THE DISK
  145 GOSUB 1000:REM                 READ THE ERROR CHANNEL
  150 GOTO 120
  160 CLOSE 2:REM                    CLOSE TEST FILE
  200 REM ***********************
  201 REM *                     *
  202 REM *   READ TEST FILE    *
  203 REM *                     *
  205 REM ***********************
  206 PRINT"3READ TEST FILE"
  210 OPEN2,8,2,"0: TEST FILE ,S,R":REM  OPEN LOGICAL FILE 2 ON DISK 8 TO
  211 REM                           CHANNEL 2 NAMED TEST FILE WITH
  212 REM                           SEQUENTIAL READ
  215 GOSUB 1000:REM                READ THE ERROR CHANNEL
  220 INPUT#2,A$(I),B(I):REM        READ STRING INTO STRING ARRAY A$
  221 REM                           AND NUMBER INTO ARRAY B
  224 RS=ST:REM                     STORE THE DISK STATUS
  225 GOSUB 1000:REM                READ THE ERROR CHANNEL
  230 PRINTA$(I),B(I):REM           PRINT WHAT WAS READ
  240 IFR S=64 THEN 300:REM         CHECK FOR END OF FILE STATUS
  250 IF RS<>0 THEN 400:REM         CHECK FOR ERROR IN FILE STATUS
  260 I=I+1:REM                     ADD 1 TO ARRAY POINTER
  270 GOTO 220
  300 CLOSE 2:REM                   CLOSE TEST FILE
  310 END:REM                       END THE PROGRAM EXECUTION
  400 PRINT"3BAD▮DISK▮STATUS▮IS▮"RS
  410 CLOSE 2:REM                   CLOSE TEST FILE
  420 END:REM                       END THE PROGRAM EXECUTION
```

NEW 64

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```
 1000 REM ************************
 1001 REM *   READ THE ERROR     *
 1002 REM *      CHANNEL         *
 1005 REM ************************
 1010 INPUT#15,EN$,EM$,ET$,ES$:REM    READ ERROR
 1011 REM                             EN$ IS THE ERROR NUMBER
 1012 REM                             EM$ IS THE ERROR MESSAGE
 1013 REM                             ES$ IS THE ERROR SECTOR
 1020 IF EN$="00" THEN RETURN:REM     RETURN TO MAIN LOGIC IF NO ERRORS
 1030 PRINT"♥ERROR ON DISK":REM       PRINT THE ERROR
 1040 PRINTEM$,EN$,ET$ES$:REM         PRINT THE ERROR
 1050 CLOSE 2:REM                     CLOSE TEST FILE
 1060 END:REM                         END THE PROGRAM EXECUTION
READY.
```

Compulsion

Another game for Commodore machines, which will again work on the 64 without any alterations.

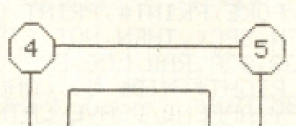
It is a version of the popular game Simon, where the computer displays a sequence of numbers on the screen, and you, the user, have to then key in the same sequence. With each one that you get correct, the computer then displays one extra number next time round, until it becomes virtually impossible to remember each number displayed, in the correct order.

With two levels of play, easy and hard, your only problem in entering the program will be encountered in lines 810 to 910, which displays the board on the screen. You'll simply have to hunt around the keyboard to find the relevant keys. They're all there, so don't despair!

```
COMPULSION : ANY COMMODORE MACHINE : JOHN CONSADINE

 10 PRINT"♥◘◘"TAB(13)"COMPULSION"
 20 PRINTTAB(13)"‾‾‾‾‾‾‾‾‾‾"
 30 REM**BY J.CONSADINE (HULL)           **
 40 PRINT"◘◘◘◘▶DO YOU WANT INSTRUCTIONS? (Y/N)":GOSUB780
 50 IFA$="N"THEN160
 60 IFA$<>"Y"THENPRINT"♥":GOTO40
 70 PRINT"♥◘◘YOU WILL BE SHOWN A RANDOM SEQUENCE"
 80 PRINT"◘OF THE NUMBERS-1,2,4,5."
 90 PRINT"◘◘◘MEMORISE THE SEQUENCE AND TRY TO"
 100 PRINT"◘REPEAT IT BY USING THE KEYS"
 110 PRINT"◘CORRESPONDING TO THE NUMBERS SHOWN."
 120 PRINT"◘◘◘YOU CAN CHOOSE AN EASY OR HARD GAME"
 130 PRINT"◘BUT EACH SUCCESSIVE GO AT THAT LEVEL"
 140 PRINT"◘WILL BECOME MORE COMPLEX."
 150 PRINT"◘◘▓PRESS ANY KEY TO CONTINUE.":GOSUB780
 160 DIMP$(25),BE(25),S(25)
 170 P$(1)="▓◘◀◘◀◘◀◘◀◘◀◘◀◘◀◘◀◘◀◘◀◘◀◘◀◘◀▶▶▶▶▶▶▶▶▶▶▶▶▶▶▓"
 180 P$(2)="▓◘◀◘◀◘◀◘◀◘◀◘◀◘◀◘◀◘◀◘◀◘◀◘◀◘◀▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▓"
 190 P$(4)="▓◘◀◘◀◘◀◘◀◘◀◘◀◘◀▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▓"
 200 P$(5)="▓◘◀◘◀◘◀◘◀◘◀◘◀◘◀▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▓"
 210 EE$=" ":FORA=1TO200:E$=E$+EE$:NEXT:E$="⌂♥"+E$+"⌂":REM*ERASE TOP LINES
 220 ER$="▓◘◀◘◀◘◀◘◀◘◀◘◀◘◀◘◀◘◀◘◀◘◀◘◀◘◀▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▶▓"
 230 NUM(1)=4:NUM(2)=4
 240 PRINT"♥◘◘WHAT IS YOUR FIRST NAME";:INPUTN$
 250 PRINT"◘◘◘EASY OR HARD GAME (E/H)":GOSUB780
 260 IFA$="E"THENDELAY=600:GOTO290
 270 IFA$="H"THENDELAY=200:GOTO290
 280 GOTO250
 290 GOSUB810:REM*DRAW PICTURE
 300 PRINTE$:PRINT"♥WHEN YOU ARE READY "N$
 310 PRINT"PRESS SPACE BAR.":GOSUB780
 320 IFA$<>" "THEN300
 330 PRINTE$:PRINT"HERE WE GO!!":GOSUB800:PRINTE$:GOSUB800
 340 N=1
 350 NO=INT((RND(1)*5)+1):IFNO=3THEN350
 360 NO$=STR$(NO):NO$=RIGHT$(NO$,1)
 370 PRINTP$(NO)"▓"NO$:FORA=1TODELAY:NEXT
 380 PRINTP$(NO)"■"NO$:FORA=1TODELAY:NEXT
 390 S(N)=NO:IFDELAY=600THENIFN=NUM(1)THEN420
 400 IFDELAY=200THENIFN=NUM(2)THEN420
 410 N=N+1:GOTO350
 420 PRINTE$:PRINT"NOW YOU REPEAT THE SEQUENCE!":IFDELAY=600THENNUM=NUM(1)
 430 IFDELAY=200THENNUM=NUM(2)
 440 FORX=1TONUM
 450 GOSUB780:A=VAL(A$)
 460 IFA<>S(X)THEN620
 470 PRINTP$(A)"▣"A$:FORY=1TO100:NEXT
 480 PRINTP$(A)"▤"A$
 490 NEXT
 500 FORB=1TO20
 510 PRINTER$"▣SUCCESS":PRINTP$(1)"▣1":PRINTP$(2)"▣2"
 520 PRINTP$(4)"▣4":PRINTP$(5)"▣5"
 530 FORX=1TO50:NEXT
 540 PRINTER$"▤SUCCESS":PRINTP$(1)"▤1":PRINTP$(2)"▤2"
 550 PRINTP$(4)"▤4":PRINTP$(5)"▤5":NEXT
 560 IFDELAY=600THENIFNUM(1)>NO(1)THENBE$=N$:NO(1)=NUM(1)
 570 IFDELAY=200THENIFNUM(2)>NO(2)THENBH$=N$:NO(2)=NUM(2)
 580 PRINTE$:PRINT"▥BEST HARD GAME IS "BH$" WITH "NO(2)"NUMBERS"
 590 PRINT"BEST EASY GAME IS "BE$" WITH "NO(1)"NUMBERS"
 600 PRINT"▼▼▼▼▣PRESS ANY KEY.":GOSUB780
 610 GOTO730
 620 PRINTE$:PRINT"WRONG--WRONG--WRONG--WRONG!!!"
 630 PRINTER$"▣WRONG!":PRINTP$(1)" ":PRINTP$(2)" ":PRINTP$(4)" ":PRINTP$(5)" "
 640 FORA=1TO2000:NEXT
 650 PRINTE$:PRINT"DO YOU WISH TO SEE CORRECT SEQUENCE?"
 660 PRINT"(Y/N)":GOSUB780:IFA$="N"THENNUM(1)=4:NUM(2)=4:GOTO730
 670 IFA$<>"Y"THEN650
 680 PRINTER$"       ":PRINTE$:PRINT"THIS IS WHAT YOU SHOULD HAVE DONE.":GOSUB800
 690 FORX=1TONUM:NO=S(X):NO$=STR$(NO):NO$=RIGHT$(NO$,1)
 700 PRINTP$(NO)"▣"NO$:FORA=1TODELAY:NEXT
 710 PRINTP$(NO)"▤"NO$:FORA=1TODELAY:NEXT
 720 NEXTX:NUM(1)=4:NUM(2)=4
 730 PRINTE$:PRINT"ANOTHER GO ?":GOSUB780
 740 IFA$="Y"THENIFDELAY=600THENNUM(1)=NUM(1)+1:NUM(2)=4:GOTO290
 750 IFA$="Y"THENIFDELAY=200THENNUM(2)=NUM(2)+1:NUM(1)=4:GOTO290
 760 IFA$="N"THENEND
 770 GOTO730
 780 GETA$:IFA$=""THEN780
 790 RETURN
 800 FORA=1TO1500:NEXT:RETURN
 810 PRINT"▥▼▼▼▼▼▼▼▼▶▶▶▶▶▶▶▶▶▶▶▶▶╱‾╲▶▶▶▶▶▶▶▶▶▶▶▶▶╱‾╲"
 820 PRINT"▶▶▶▶▶▶▶▶▶▶▶▶ 4 ├──────────────┤ 5 │"
 830 PRINT"▶▶▶▶▶▶▶▶▶▶▶▶╲_╱▶▶▶▶▶▶▶▶▶▶▶▶▶╲_╱"
 840 PRINT"▶▶▶▶▶▶▶▶▶▶▶▶▶▶││▶▶└──────────┘▶▶▶││"
 850 PRINT"▶▶▶▶▶▶▶▶▶▶▶▶▶▶││▶│ ▶▶▶▶▶▶▶▶▶▶ ▶▶││"
 860 PRINT"▶▶▶▶▶▶▶▶▶▶▶▶▶▶│   │          │   │"
 870 PRINT"▶▶▶▶▶▶▶▶▶▶▶▶▶▶│   └──────────┘   │"
 880 PRINT"▶▶▶▶▶▶▶▶▶▶▶▶▶▶│                  │"
 890 PRINT"▶▶▶▶▶▶▶▶▶▶▶▶╱‾╲▶▶▶▶▶▶▶▶▶▶▶▶▶╱‾╲"
 900 PRINT"▶▶▶▶▶▶▶▶▶▶▶▶ 1 ├──────────────┤ 2 │"
 910 PRINT"▶▶▶▶▶▶▶▶▶▶▶▶╲_╱                  ╲_╱":RETURN
READY.
```

```
NOW YOU REPEAT THE SEQUENCE!
```



BASIC PROGRAMMING

Software Test

A short utility, which could be extended to cover every Commodore machine, but in its presented form here works for Basic 2 and 4 40 and 80 column machines with 9 inch or twelve inch screens.

It revolves around memory location 57345, which happily returns a different value if PEEKed for the PET/CBM family of computers. Simply by reading this value, a program running on the computer can tell which computer it is working on, and adjust itself accordingly.

```
SOFTWARE TEST : P.G. : ANY PET


 120 REM THIS IS A SOFTWARE TEST TO SEE WHAT
 125 REM MACHINE A PROGRAM IS RUNNING ON
 130 IF PEEK(57345)=72THENV$="2":REM BASIC 2 PET
 140 IF PEEK(57345)=127THENV$="4":REM 9" BASIC 4 PET
 150 IF PEEK(57345)=54THENV$="5":REM 12" BASIC 4 PET
 155 IF PEEK(57345)=75THENV$="8":REM 80 COLUMN MACHINE
 156 IF V$=""THENPRINT"MACHINE NOT KNOWN":NEW
 160 PRINT V$
READY.
```

Lister

This program will work on any Commodore computer, provided you are connected up to a disk drive; having a printer available makes sense, though it isn't, strictly speaking, essential.

The program takes another BASIC program from the disk, and converts all the cursor control, reverse, colour, window etc. commands that it finds into a more readable form. These are defined in lines 170 to 210, and can easily be changed if required. For instance, if you'd prefer CR to RIGHT, just go ahead and change it.

This, we realise, is not inviting standardisation, but for home use we feel everyone ought to use the system they are most familiar with.

It is slow in operation, and prints out the resultant 'clear' listing either to the screen or the printer. A printer therefore makes it possible to make a permanent hard copy.

Nonetheless, it works!

```
LISTER : SEE DESCRIPTION : THE UNKNOWN AUTHOR


 100 DATA 19,147,17,145,29,157,18,146,20,148,141
 110 REM 80-COLUMN CURSOR STUFF
 120 DATA 7,21,149,22,150,14,142,25,153
 130 DATA 15,143
 140 REM VIC STUFF
 150 DATA 144,5,28,159,156,30,31,158
 160 DATA 8,9
 170 DATA HOME,CLEAR,DOWN,UP,RIGHT,LEFT,RVS,RVOFF,DEL,INST,RETURN
 180 DATA BELL,D.LINE,I.LINE,ER.BEGIN,ER.END,TEXT,GRAPHIC,SCROLL.UP,SCROLL.DOWN
 190 DATA TOP,BOTTOM
 200 DATA BLACK,WHITE,RED,CYAN,MAGENTA,GREEN,BLUE,YELLOW
 210 DATA LOCK,UNLOCK
 220 DIMA(31),A$(31),K$(90)
 230 FORJ=0TO31:READA(J):NEXTJ
 240 FORJ=0TO31:READA$(J):NEXTJ
 250 DATA END,FOR,NEXT,DATA,INPUT#,INPUT,DIM,READ,LET,GOTO,RUN,IF,RESTORE,GOSUB
 260 DATA RETURN,REM,STOP,ON,WAIT,LOAD,SAVE,VERIFY,DEF,POKE,PRINT#,PRINT,CONT
 270 DATA LIST,CLR,CMD,SYS,OPEN,CLOSE,GET,NEW,TAB(,TO,FN,SPC(,THEN,NOT,STEP
 280 DATA +,-,*,/,↑,AND,OR,>,=,<,SGN,INT,ABS,USR,FRE,POS,SQR,RND,LOG,EXP,COS
 290 DATA SIN,TAN,ATN,PEEK,LEN,STR$,VAL,ASC,CHR$,LEFT$,RIGHT$,MID$,GO,CONCAT
 300 DATA DOPEN,DCLOSE,RECORD,HEADER,COLLECT,BACKUP,COPY,APPEND,DSAVE,CATALOG
 310 DATA RENAME,SCRATCH,DIRECTORY
 320 FORJ=0TO89:READK$(J):NEXTJ
 400 CLOSE1:INPUT"NAME OF PROGRAM FILE";G$
 410 OPEN 1,8,3,G$+",P,R"
```

```
420 GET#1,A$,B$
430 IFB$<>CHR$(4)ANDB$<>CHR$(16)GOTO400
440 IFA$=""THENA$=CHR$(1):GET#1,X$
450 INPUT"LINE NUMBER RANGE  -■■■";Z$
460 L0=0:L1=0:L2=1E9
470 FORJ=1TOLEN(Z$):Y$=MID$(Z$,J,1)
480  Y=ASC(Y$):IFY>=48ANDY<=57GOTO510
490  IFY=32GOTO510
500  L0=J:IFY<>45GOTO600
510 NEXTJ
520 IFL0<LEN(Z$)THENL2=VAL(MID$(Z$,L0+1)):IFL2=0THENL2=1E9
530 IFL0>1THENL1=VAL(Z$)
540 IFL0=0THENL1=L2
600 P3$="[":P4$="]":INPUT"LIST TO PRINTER  N■■■";Z$
610 P=3:IFASC(Z$)=89THENP=4:L$="X":P3$=CHR$(219):P4$=CHR$(221)
620 P1$="[":P2$="]":INPUT"GRAPHICS OR TEXT  G■■■";Z$
630 POKE59468,12:IFASC(Z$)=84THENPOKE59468,14:M$=L$:P1$=P3$:P2$=P4$
640 INPUT"TRANSLATE CURSOR MOVES  N■■■";Z$
650 IFASC(Z$)=89THENT7=1
660 OPEN4,P:F$=P1$
670 J=80:IFP<>3GOTO690
680 PRINT"■":PRINT"++++++++++++":FORJ=1TO81:IFPEEK(32768+J)=32THENNEXTJ
690 L9=J:PRINT#4,"PROGRAM:  ";G$
700 REM NEW LINE
710 GOSUB2010:Q=0:T1=1:C1=-1:GET#1,A$,B$:IFST<>0GOTO3000
720 IFB$=""GOTO3000
730 GET#1,A$,B$
740 L=ASC(A$+CHR$(0))+ASC(B$+CHR$(0))*256
750 IFL<L1GOTO1080
760 IFL>L2GOTO3000
770 F2=1:PRINT#4,M$;P$:P$=STR$(L)+" "
800 REM START TEXT HERE
810 GET#1,A$:IFA$=""GOTO710
820 T=0:A=ASC(A$):IFQ=0OR(AAND127)>31ORT7=0GOTO900
830 FORJ=0TO31:IFA=A(J)THENB$=A$(J):GOTO850
840 NEXTJ:GOTO1000
850 IFB$=B1$THENB=B+1:GOTO810
860 IFB>0THENA$=MID$(STR$(B+1),2)+F$+B$:GOTO880
870 A$=F$+B$
880 B=0:B1$=B$:F$=",":F1=1:GOTO1010
900 A=A-128:IFA<0ORQ<>0GOTO1000
910 IFA=127THENA$="π":GOTO1000
920 T=1:A$=K$(A)
930 IFA=15THENQ=2
1000 GOSUB2010
1010 IFA$=CHR$(34)THENQ=1-Q
1020 REM C=-1 FOR ALPHANUMERIC
1030 C=ASC(LEFT$(A$,1)):C=(C<48ORC>57)AND(C<65ORC>90)
1040 IFT<>T1ORT=1THENT1=T:IFNOTCANDNOTC1THENP$=P$+" ":GOSUB2500
1050 C=ASC(RIGHT$(A$,1)):C1=(C<48ORC>57)AND(C<65ORC>90)
1060 P$=P$+A$:GOSUB2500
1070 GOTO810
1080 REM SKIP TO NEXT LINE
1090 GET#1,A$:IFA$=""GOTO710
1100 GOTO1090
2000 REM CLOSE OFF CURSOR EXPRESSION
2010 IFF1=0GOTO2040
2020 IFB>0THENP$=P$+MID$(STR$(B+1),2):GOSUB2500
2030 B=0:F1=0:B1$="":P$=P$+P2$:GOSUB2500:F$=P1$
2040 RETURN
2500 IFLEN(P$)<L9GOTO2600
2510 FORJ=L9TOL9*.6STEP-1
2520 IFMID$(P$,J,1)=":"GOTO2580
2530 NEXTJ:FORJ=L9-1TOL9*.6-1STEP-1
2540 P=ASC(MID$(P$,J))
2550 IFP=91GOTO2580
2560 IFP=59ORP=44ORP=93THENJ=J+1:GOTO2580
```

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```
 2570 NEXTJ:J=L9-1
 2580 PRINT#4,M$;LEFT$(P$,J-1)
 2590 P$="     "+MID$(P$,J)
 2600 RETURN
 3000 IFLEN(P$)>0THENF2=1:PRINT#4,M$;P$
 3010 IFF2=0THENPRINT"** NO LINES FOUND **"
 3020 CLOSE1:GOSUB2000:CLOSE4
READY.
```

```
PROGRAM:  LISTER

 600 P3$="[":P4$="]":INPUT"LIST TO PRINTER  N[LEFT3]";Z$
 610 P=3:IF ASC(Z$)=89 THEN P=4:L$="[DOWN]":P3$=CHR$(219):P4$=CHR$(221)
 620 P1$="[":P2$="]":INPUT"GRAPHICS OR TEXT  G[LEFT3]";Z$
 630 POKE 59468,12:IF ASC(Z$)=84 THEN POKE 59468,14:M$=L$:P1$=P3$:P2$=P4$
 640 INPUT"TRANSLATE CURSOR MOVES  N[LEFT3]";Z$
 650 IF ASC(Z$)=89 THEN T7=1
```

Firstly three short programs for the VIC-20, sent in by a young boy, James Watson of Chapel town Sheffield. The first program is described by James as a welcome program, this uses the print statement for most of the program. Below is a brief resume of the program.

Lines 10 - 60 print up and format the opening messages. Lines 70 - 90 get the required key press and continue if it is 'A', but return to line 70 if it is anything else. Line 100 clears the screen, lines 110 - 160 print display the colours available including the background colour. Lines 170 - 190 are the key press again and the error check. Lines 200 - 280 clears the screen prints some more text, gets the key press and clears the screen.

The next section of the program gives you three choices of display and the rest of the program sorts out which display to go to, performs the chosen routine. The obvious thing about this program is its simplicity, but remember the programmer is very young. Taking this into account there is some very interesting information within the program and a good programming style is used throughout.

The second program from James Watson is a Temperature Conversion, and line 40 is the line that actually does the converting. The rest of the program is concerned with printing and inputs. The last program from James is a V.A.T. program, after entering the object as A$ and the price as B line 60 gives the V.A.T. for the article. Again this is not the best program ever written seen but considering the age of the programmer it is very good. Hopefully we will hear more from Master Watson and all the other budding programmers out there, as soon as they get out of their diapers.

```
READY.


   10 PRINT"▨THE WELCOME PROGRAM"
   20 PRINT"THE VIC 20"
   30 PRINT"5K-48K RAM"
   40 PRINT"THIS PROGRAM IS TO    W
ELCOME"
   50 PRINT"YOU TO THE VIC"
   60 PRINT"▨▨▨▨▨▨▨▨▨▨PRESS 'A' TO G
O ON"
   70 GETA$:IFA$=""THEN70
   80 IFA$="A"THENGOTO100
   90 GOTO70
   100 PRINTCHR$(147)
   110 PRINT"THE VIC HAS 8 COLOUR
 KEYS"
   120 PRINT" :- ■BLACK,     ≡WHITE,
   RED, CYAN,      PURPLE,  GREE
N,      YELLOW, BLUE"
```

```
   130 PRINT"YOU ARE WONDERING WHY
THERE IS A SPACE"
   140 PRINT"THIS IS BECAUSE THE
COLOUR IS"
   150 PRINT"WHITE"
   160 PRINT"▨▨▨▨▨▨▨▨▨▨PRESS 'A' TO G
O ON"
   170 GETB$:IFB$=""THEN170
   180 IFB$="A"THENGOTO200
   190 GOTO170
   200 PRINTCHR$(147)
   210 PRINT"THE LIGHT BROWN KEYS
ON THE RIGHT-HAND     SIDE"
   220 PRINT"ARE CALLED USER
DEFINEABLE KEYS"
   230 PRINT"THESE ARE USED IN
GAMES"
   240 PRINT"▨▨▨▨▨▨▨▨▨▨PRESS 'A' TO G
O ON"
   250 GETC$:IFC$=""THEN250
```

```
 260 IFC$="A"THENGOTO280
 270 GOTO250
 280 PRINTCHR$(147)
 290 PRINT"   CHOOSE A NUMBER"
 300 PRINT
 310 PRINT"   1. SOME GRAPHICS"
 320 PRINT"   2. WELCOME PROG.
 330 PRINT"   3. END PROGRAM."
 340 PRINT
 350 PRINT
 360 PRINT"▒▒▒▒▒▒▒    ▒PRESS 'A' T
O GO ON"
 370 GETD$:IFD$=""THEN370
 380 IFD$="A"THENGOTO400
 390 GOTO370
 400 PRINTCHR$(147)
 410 PRINT"▒CHOOSE (1, 2 OR 3)■"
 420 GETE$:IFE$=""THEN420
 430 IFE$="1"THENGOTO470
 440 IFE$="2"THENGOTO640
 450 IFE$="3"THENGOTO740
 460 GOTO420
 470 PRINTCHR$(147)
 480 PRINT"   SOME GRAPHICS"
 490 PRINT"   1. ╱●╲"
 500 PRINT
 510 PRINT"   2. ╲O╱"
 520 PRINT"       ▒ "
 530 PRINT"      ╱ ╲"
 540 PRINT
 550 PRINT"   3. ╲●╱"
 560 PRINT
 570 PRINT"1. A BIRD MADE OF
 'SHIFT AND UQI'"
 580 PRINT"2. A MAN 'SHIFT MWN,
2ND LINE COMMODORE   AND +, 3RD L
INE SHIFT AND NM"
 590 PRINT"3. ANOTHER BIRD 'SHIFT
 AND JWK"
 600 PRINT"YOUR NAME?"
 610 INPUTX$
 620 PRINT"BYE ";X$
 630 STOP
 640 PRINT"   WELCOME PROGRAM"
 650 PRINT"+ - * /"
 660 PRINT"+: PLUS"
 670 PRINT"-: MINUS"
 680 PRINT"*: TIMES"
 690 PRINT"/: DIVIDE"
 700 PRINT"YOUR NAME?"
 710 INPUTY$
 720 PRINT"THANKS ";Y$
 730 STOP
 740 PRINT"YOUR NAME?"
 750 INPUTZ$
 760 PRINT"THANKS, BYE ";Z$
 770 STOP
```

```
READY.

  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

READY.
```

```
  10 PRINT"▒▒▒▒▒ENTER OBJECT"
  20 INPUTA$:PRINT
  30 PRINT"ENTER PRICE OF ":PRINT:
PRINTA$
  40 INPUTB:PRINT
  50 PRINT"V.A.T. IS 15%":PRINT
  60 PRINT"PRICE OF":PRINT:PRINTA$
:PRINT:PRINT"IS";B+B*.15
  70 END

READY.
```

```
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READY.
```

```
  10 PRINT"▒▒▒▒▒TEMPATURE CONVERS
ION"
  20 PRINT:INPUT"DEGREES FAHREHEIT
";F
  30 PRINT:PRINTF" DEGREES FAH."
  40 PRINT:PRINT"IS"(F-32)*5/9:PRI
NT"DEGREES CENT."
  50 PRINT
  60 PRINT"▒PRESS 'A' TO CON.■"
  70 PRINT"▒PRESS 'Z' TO END■"
  80 GETA$:IFA$=""THEN80
  90 IFA$="A"THENGOTO10
```

BASIC PROGRAMMING

```
  100 IFA$="Z"THENPRINT"▯ GOODBYE"
 :SYS64802
  110 GOTO80

READY.


  10 PRINT"▯▯▯▯▯TEMPATURE CONVERS
 ION"
```

Next in this section are four programs for the VIC-20. All of these programs will work on the unexpanded machine. The first of these is a light hearted program that draws up a map of North America. The other three are all games:

```
1 REM MAP
2 REM ************************
3 REM
10 REM THIS PROGRAM DRAWS A COLOURED MAP OF NORTH AMERICA
20 REM
30 REM
100 REM SET MAP BACKGROUND COLOUR AS BLUE
110 REM
130 POKE36879,110
140 PRINT"▯"
165 REM
200 REM DRAW THE U.S.A. IN GREEN
205 REM
210 READ R,S,L
220 IF R=100 THEN GOTO 500
230 P=38400+R*22+S
235 X=7680+R*22+S
240 FOR Q=0 TO L-1
250 POKE P+Q,5
255 POKE X+Q,160
260 NEXT Q
270 REM
280 GOTO 210
290 REM
300 REM DATA FOR PLOTTING U.S.A.
305 REM
310 DATA 6,1,4
320 DATA 7,1,14,7,18,2,8,0,14,8,17,3
330 DATA 9,0,15,9,16,4,10,0,19
340 DATA 11,0,18,12,0,18,13,1,17,14,1,17
350 DATA 15,2,15,16,6,11,17,7,8,17,15,2
360 DATA 18,8,5,18,16,2,19,17,1
370 DATA 100,100,100
495 REM
500 REM DRAW CANADA AND MEXICO IN WHITE
505 REM
510 READ R,S,L
520 IF R=100 THEN 900
530 P=38400+R*22+S
535 X=7680+R*22+S
540 FOR Q=0 TO L-1
550 POKE P+Q,1
555 POKE X+Q,160
560 NEXT Q
570 GOTO 510
595 REM
600 REM DATA FOR CANADA AND MEXICO
605 REM
610 DATA 0,0,20,1,0,20
620 DATA 2,0,20,3,0,20,4,0,20,5,1,19,6,5,15,7,15,5,8,16,3,9,17,1
```

```
 625 DATA 16,2,4,17,2,1,17,4,3,18,3,1,18,5,5,19,5,8,20,5,8
 630 DATA 21,5,8
 700 DATA 100,100,100
 895 REM
 900 REM PUT NAMES ON MAP
 905 REM
 910 FOR I=1 TO 3
 920 READ R,S,X$
 930 X=7680+22*R+S
 950 FOR Q=0 TO LEN(X$)-1
 970 POKE X+Q,ASC(MID$(X$,Q+1,1))+64
 980 NEXT Q
 990 NEXT I
 1000 GET A$:IF A$="" THEN 1000
 1010 PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒"
 1020 POKE36879,27
 1030 END
 1050 DATA 3,6,"CANADA"
 1060 DATA 20,6,"MEXICO"
 1070 DATA 12,8,"USA"
READY.
```

Duck Shoot : In this game, you have to shoot arrows at the ducks flying across the top of the screen. You are limited to ten arrows and you must either hit the head or the tail of the duck to kill it. The commands to move to bow and to fire are: Z - left,

C - right,

M - to fire the arrow.

```
100 PRINT"▒":POKE650,255:POKE36879,174:DIMD%(4,1):HI=0:POKE36878,10
110 FORT=1TO4:D%(T,1)=1:D%(T,0)=7784+T*5
120 NEXT:CO=30720:SC=0:AR=0:AF=0
130 G=8152:POKEG+CO,1:POKEG+CO-1,1:POKEG+CO+1,1:POKEG+CO+22,1
140 POKEG,91:POKEG-1,85:POKEG+1,73:POKEG+22,93
150 PRINT"▒▒SCORE":PRINT"▒ARROWS"
160 PRINT"▒▒▒▒▒▒▒"SC:PRINT"▒▒▒▒▒▒"10-AF"▒  ":FORI=1TO4
170 P=D%(I,0):IFD%(I,1)=1THENPOKEP,32:POKEP+22,32:POKEP+45,32
180 P=P+1:IFP>7808THEN240
190 IFD%(I,1)=0THEN270
200 POKEP+CO,7:POKEP+CO+2,3:POKEP+CO+3,5:POKEP+CO+22,7:POKEP+CO+23,7:POKEP+CO+24
,3
210 POKEP+CO+45,4:POKEP,223:POKEP+1,32:POKEP+2,81:POKEP+3,60:POKEP+22,95
220 POKEP+23,160:POKEP+24,105:POKEP+45,78
230 GOTO270
240 IFD%(I,1)=0THEN260
250 POKEP,32:POKEP+1,32:POKEP+2,32:POKEP+22,32:POKEP+23,32
260 D%(I,0)=7789:D%(I,1)=1:GOTO280
270 D%(I,0)=P
280 GETA$:IFA$<>"Z"ANDA $<>"C"THEN340
290 POKEG-1,32:POKEG+1,32:POKEG+22,32
300 G=G+(A$="Z")-(A$="C"):IFG<8143THENG=8143
310 IFG>8162THENG=8162
320 POKEG+CO,1:POKEG+CO-1,1:POKEG+CO+1,1:POKEG+CO+22,1
330 POKEG,91:POKEG-1,85:POKEG+1,73:POKEG+22,93
340 IFAR=0THEN450
350 POKEAR,32:AR=AR-22:IFAR<7724THENAR=0:GOTO160
360 P=PEEK(AR):POKEAR+CO,2:POKEAR,30:IFP=32THEN450
370 POKEAR,32:IFP=78ORP=60THENAR=0:GOTO450
380 FORJ=1TO4:P=D%(J,0):IFD%(J,1)=0THEN440
390 IFP+22<>ARANDP+23<>ARANDP+24<>ARANDP+2<>ARTHEN440
400 SC=SC+10:D%(J,1)=0:POKEP,32:POKEP+1,32:POKEP+2,32:POKEP+3,32
410 POKEP+22,32:POKEP+23,32:POKEP+24,32:POKEP+45,32
420 POKE36875,250:FORJ1=250TO200STEP-1:POKE36876,J1:FORJ2=1TO10:NEXTJ2,J1
430 POKE36875,0:POKE36876,0
```

BUSINESS AND PLEASURE ON THE 64!

The Commodore 64 is the ideal machine to combine business with pleasure. It has a typewriter keyboard and lots of memory — ideal for word processing or financial planning — plus some rather clever colour and sound chips that are just what you need for realistic arcade action.

BUSICALC is just the program for those who need to juggle with figures. You could use it to plan your household finances or your personal tax — but it's equally capable of handling much larger figures. If you've got a printer you'll be able to produce reports that are good enough to put before the board (or the bank manager) — but a printer isn't necessary, and neither is a disk drive. BUSICALC costs just £39 plus VAT on tape, or £40.50 on disk; there are versions at the same prices for the PET and VIC-20 (with 16k expansion).

The best word processor you can buy for the 64 is VIZAWRITE. The first thing you'll like is being able to use it right away — you won't have to re-read the manual ninety-four times to find out how to get started. The next is the wide range of printers you can use from the VIC printer to a Diablo or Qume — plus many others in between (like the Epson). Virtually any parallel printer can be operated off the User Port for the price of a simple cable, and features such as underlining, superscripts, subscriptions, and emphasised printing are easily accessed. Formatting on screen means that you can see the text as it will print before it prints — and this isn't the only resemblance between VIZAWRITE and dedicated word processing stations costing £10,000 or more. VIZAWRITE costs a mere £69 plus VAT on disk; a tape-based version should be available very soon.

MIKRO ASSEMBLER plugs into the cartridge port of the 64. As PET and VIC owners are already well aware, MIKRO makes writing machine code programs almost as easy as Basic, because it is a real assembler with LABELS. To help you write your program MIKRO has AUTO, DELETE, and FIND commands; to help you debug it there's a machine code monitor; and you can DISASSEMBLE from Basic or in the monitor! The TABLE commands displays or prints an alphabetically sorted symbol table after assembly — which is really fast (MIKRO will assemble 2k of code in just 20 seconds). If you are writing more than (say) 4k of code you may have to split your source code into several files, but MIKRO will automatically link these together at assembly time, loading them from tape or disk as appropriate. The MIKRO module costs £50 plus VAT; it could be the best investment you ever make.

With ARROW installed in your 64 the Commodore cassette unit LOADS AND SAVES PROGRAMS SEVEN TIMES FASTER! Almost as fast as the 1541 disk, in fact. There is however a small difference in price — because ARROW costs just £39 plus VAT. ARROW has its own load and save commands, so you can still load and save at normal speed if you should want to. ARROW is a tried and tested product that we've been selling on the PET for several years; now 64 owners can also benefit.

Now for the lighter side of our range. TANK ATAK, KAKTUS and MANGROVE are arcade games with colour and sound; a joystick is recommended, but is not esential. They each cost £8 plus VAT on cassette or £9.50 on disk. THE HITCH-HIKER'S GUIDE TO THE GALAXY is an adventure based (with the kind permission of Douglas Adams and Pan Books) on the characters and scenarios in the popular series. If you divide the price of £12 plus VAT (£13.50 on disk) by the number of hours you'll spend exploring the galaxy the answer will be a very small number indeed!

Supersoft
Winchester House, Canning Road,
Wealdstone, Harrow,
Middlesex, HA3 7SJ, England
Telephone: 01-861 1166

BASIC PROGRAMMING

```
440 NEXTJ:AR=0
450 NEXTI:POKE36877,0:IFAR=0ANDAF<10ANDA$="M"THENAR=G-22:AF=AF+1:POKE36877,230
460 IFAF<10ORAR<>0THEN160
470 FORI=1TO1000:NEXT:PRINT"██YOU'VE   RUN   OUT   OF          ARROWS"
480 IFSC>HITHENHI=SC:PRINT"█YOU   BEAT   THE   HIGH            SCORE":GOTO500
490 PRINT"█HIGH SCORE IS"HI
500 FORI=1TO1000:GETA$:IFA$="S"THEN PRINT"█BYE":POKE36878,0:END
510 NEXT:PRINT"█":GOTO110
900 POKE36879,27

READY.
```

Golf : The instructions for golf are included in the program but here is a small description. You have a choice of 9 clubs to use and a choice of hard, medium, or soft hitting strength. The rest is obvious.

```
100 POKE36879,221:GOSUB1000:POKE650,250
110 S=2:SC=7680:CO=38400:AC=0:A=1:C1=1:HO=1
120 UN=32:UC=5:NU=32:CU=5:YB=20:XB=INT(RND(     )+1):XC=INT(RND(1)*3+2)
130 HI=0:PRINT"██";:FORI=1TO12:XC=INT(RND(1)*506):POKECO+XC,2:POKESC+XC,88:NEXT
140 XC=INT(RND(1)*3+3)
150 FORI=1TOXC:PRINT"█";:NEXT:FORI=2TOINT(RND(1)*6+2)
160 PRINT"█";:NEXT:PRINT"▁▁█▔▔▔    ██▒ ██▒▒ ██▒ ▀▁▁";
170 PRINT"████████████████▔▔█            Q    ▔███████████████▀    ▬      ▬";
180 PRINT"████████████████▔▔▔▔█▁▁█          ███████      ▀ ";
190 PRINT"████████▔▔▔▔█▁▀  "
200 PRINT"█":FORI=1TO9+INT(RND(1)*5):PRINT"█";:NEXT
210 FORI=1TOINT(RND(1)*17):PRINT"█";:NEXT:PRINT"▒▒▒▒▁▁▁██████▒▒ ████▒"
220 PRINT"█":FORI=1TO8+INT(RND(1)*6):PRINT"█";:NEXT
230 FORI=1TOINT(RND(1)*17):PRINT"█";:NEXT:PRINT"▒▒▒████▒▒▒▒█████▒ ████▒ "
240 YC=21:XC=10:HH=1:UN=32:UC=1
250 POKECO+YB*22+XB,1:POKESC+YB*22+XB,81
260 PRINT"██CLUB"
270 GETA$:IFA$<"1"ORA$>"9"THEN270
280 PRINT"█"TAB(5);A$:CL=VAL(A$)
290 PRINT"█"TAB(7)"STRENGTH ";:IFHH=1THENPRINT"SOFT"
300 IFHH=2THENPRINT"MED "
310 IFHH=3THENPRINT"HARD"
320 C=93:IFA=2THENC=77
330 IFA=3THENC=64
340 IFA=4THENC=78
350 GETA$:IFA$<>"A"ANDA$<>"D"ANDA$<>"W"ANDA$<>"X"THEN440
360 POKECO+YC*22+XC,UC
370 POKESC+YC*22+XC,UN:XC=XC+(A$="A")-(A$="D"):YC=YC+(A$="W")-(A$="X")
380 IFYC<2THENYC=2
390 IFYC>21THENYC=21
400 IFXC<0THENXC=0
410 IFXC>21THENXC=21
420 UN=PEEK(SC+YC*22+XC):UC=PEEK(CO+YC*22+XC)
430 IFUN=81THENYC=YB+1:GOTO420
440 POKECO+YC*22+XC,2:POKESC+YC*22+XC,C
450 A=A+(A$=".")-(A$=","):IFA<1THENA=4
460 IFA>4THENA=1
470 IFA$="H"THENHH=3
480 IFA$="M"THENHH=2
490 IFA$="S"THENHH=1
500 IFA$=>"1"ANDA$<="9"THENCL=VAL(A$):PRINT"█████"CL
510 IFA$<>" "THEN290
520 DX=0:DY=0:IFA=1ANDYC<>YBTHEN660
530 IFA=1ANDABS(XC-XB)>1THEN660
540 IFA=1ANDXC<XBTHENDX=1:GOTO690
550 IFA=1ANDXC>XBTHENDX=-1:GOTO690
```

BASIC PROGRAMMING

```
560 IFA=2AND(ABS(XC-XB)<>1ORABS(YC-YB)<>1)THEN660
570 IFA=2ANDXC<XBANDYC>YBTHENDX=1:DY=-1:GOTO690
580 IFA=2ANDXC>XBANDYC<YBTHENDX=-1:DY=1:GOTO690
590 IFA=3ANDXC<>XBTHEN660
600 IFA=3ANDABS(YC-YB)>1THEN660
610 IFA=3ANDYC<YBTHENDY=1:GOTO690
620 IFA=3ANDYC>YBTHENDY=-1:GOTO690
630 IFA=4AND(ABS(XC-XB)<>1ORABS(YC-YB)<>1)THEN660
640 IFA=4ANDXC>XBANDYC>YBTHENDX=-1:DY=-1:GOTO690
650 IFA=4ANDXC<XBANDYC<YBTHENDX=1:DY=1:GOTO690
660 PRINT"▓▓NO SHOT           ":FORI=1TO1000:NEXT:PRINT"▓"
670 POKESC+YC*22+XC,UN:POKECO+YC*22+XC,UC
680 GOTO260
690 D=INT((RND(1)*(CL/3))*3+1)*HH:IFNU=102THEND=INT(D/2):IFCU=6THEND=INT(D*2/3)
700 HI=HI+1
710 POKECO+YB*22+XB,CU:POKESC+YB*22+XB,NU:YB=YB+DY:XB=XB+DX
720 IFXB<1THENXB=20
730 IFXB>20THENXB=1
740 IFYB<3THENYB=20
750 IFYB>20THENYB=3
760 CU=PEEK(CO+YB*22+XB):NU=PEEK(SC+YB*22+XB)
770 IFNU=88THEND=1:XB=XB-DX:YB=YB-DY:GOTO720
780 POKECO+YB*22+XB,1:POKESC+YB*22+XB,81
790 FORI=1TO20:NEXT
800 IFNU=145ANDD<3ANDHH<=2THEN850
810 IF(NU=102ORNU=104)AND(D<4ORHH<3ORCU=6)THEND=1
820 D=D-1:IFD>0THEN710
830 POKESC+YC*22+XC,UN:POKECO+YC*22+XC,UC
840 GOTO260
850 PRINT"▓HOLE IN"HI"▓     "
860 AC=AC+HI
870 FORI=1TO2000:NEXT:PRINT"▓▓▓▓▓▓▓FINISHED HOLE"HO:PRINT:PRINT"SCORE SO FAR"AC
880 FORI=1TO5000:NEXT
890 HO=HO+1:IFHO<=9THENPRINT"▓":GOTO120
900 PRINT"YOU'VE COMPLETED THE COURSE"
910 PRINT:PRINT"▓SCORE"AC:GOTO1140
1000 PRINT"▓"TAB(5)"▓*** GOLF ***":PRINT"▓▓THE GOLF COURSE HAS   NINE HOLES."
1010 PRINT"WHEN CLUB IS ASKED,   GIVE A NUMBER BETWEEN 0 AND 9."
1020 PRINT"▓▓▓A = CLUB TO LEFT
1030 PRINT"▓D = CLUB TO RIGHT
1040 PRINT"▓W = CLUB UP
1050 PRINT"▓X = CLUB DOWN
1060 PRINT"▓▓▓. AND , TURNS CLUB
1070 PRINT"▓▓ ▓S FOR SOFT SHOT
1080 PRINT" ▓M FOR MEDIUM SHOT
1090 PRINT" ▓H FOR HARD SHOT
1100 PRINT"▓ ▓▓SPACE▓ = HIT BALL
1110 PRINT"▓▓PRESS ANY KEY TO START";
1120 GETA$:IFA$=""THEN1120
1130 RETURN
1140 END
```

Animals : This is the game where the computer tries to guess what animal you are thinking of by asking yes or no questions. As the game goes on, the number of animals that the computer has in its vocabulary increase. At the end of the program you can file all the animals that you have done away on tape and load them in next time.

```
100 REM (C) PET BENELUX
110 REM      EXCHANGE
120 REM
130 DIMA$(200)
140 POKE36879,25
150 A$=" A N I M A L S "
160 PRINT"▓▓▓▓"+A$:FORW=1TO150:NEXT
170 PRINT"▓▓▓▓▓IS THIS YOUR FIRST    GAME":PRINT"▓(Y/N)"
180 GOSUB920:IFA$="N"THEN330
190 PRINT"▓THIS IS THE GAME OF
200 PRINT"▓ANIMALS. YOU HAVE TO
210 PRINT"▓CHOOSE AN ANIMAL AND
220 PRINT"▓I HAVE TO ASK
230 PRINT"▓QUESTIONS TO GUESS THE";
```

```
240 PRINT"▓ANIMAL THAT YOU HAVE
250 PRINT"▓CHOSEN.
260 PRINT"▓YOU WILL ANSWER ▨Y■ OR ▨N■"
270 PRINT"TO MY QUESTIONS.
280 PRINT
290 DATA4,£QCAN IT SWIM£Y2£N3£,£ACROCODILE,£ALION
300 RESTORE:FORI=0TO3:READA$(I):NEXTI:A$(4)=""
310 GOSUB880
320 GOTO360
330 PRINT"▉▓▓▓PRESS STOP ON CASSETTE";:PRINT"RECORDER.":GOSUB880
340 OPEN1,1,0,"ANIMAL-FILE":INPUT#1,IE:FORI=0TOIE:INPUT#1,A$(I):NEXT:CLOSE1
350 PRINT"▉▓▓▓▓LOADING FINISHED.":GOSUB880
360 N=VAL(A$(0))
370 PRINT"▉_▓▮▨L■IST OF ANIMALS.
380 PRINT"_▓▮▨F■ILE ANIMALS ON TAPE.
390 PRINT"_▓▮▨S■TOP.
400 PRINT"▓▓▓HAVE YOU THOUGHT OF ANANIMAL ?"
410 GOSUB890:IFA$="L"THEN760
420 IFA$="F"THEN840
430 IFA$="S"THEN940
440 IFA$<>"Y"THEN410
450 K=1
460 GOSUB620:IFLEN(A$(K))=0THEN870
470 IFLEFT$(A$(K),2)="£Q"THEN460
480 PRINT"▓IS IT A ";RIGHT$(A$(K),LEN(A$(K))-2);" ? ";:GOSUB920:PRINTA$
490 IFA$="Y"THENPRINT"▓▓▓I GOT IT.":FORJ=1TO2000:NEXTJ
500 IFA$="Y"THENGOTO370
510 PRINT"▓WHAT ANIMAL WAS IT▓":INPUTV$
520 PRINT"▓A QUESTION TO DISTING-UISH BETWEEN A"
530 PRINTV$;" AND A ";RIGHT$(A$(K),LEN(A$(K))-2):INPUTX$
540 PRINT"▓IS THE ANSWER FOR A":PRINTV$;" Y OR N":GOSUB920
550 B$="Y":IFA$="Y"THENB$="N"
560 Z1=VAL(A$(0))
570 A$(0)=STR$(Z1+2)
580 A$(Z1)=A$(K)
590 A$(Z1+1)="£A"+V$
600 A$(K)="£Q"+X$+"£"+A$+STR$(Z1+1)+"£"+B$+STR$(Z1)+"£"
610 GOTO370
620 Q$=A$(K):PRINT:FORZ=3TOLEN(Q$)
630 IFMID$(Q$,Z,1)<>"£"THENPRINTMID$(Q$,Z,1);:NEXTZ
640 PRINT" ? ";:GOSUB920:PRINTA$
650 T$="£"+A$
660 FORX=3TOLEN(Q$)-1
670 IFMID$(Q$,X,2)=T$THEN700
680 NEXTX
690 STOP
700 FORY=X+1TOLEN(Q$)
710 IFMID$(Q$,Y,1)="£"THEN740
720 NEXTY
730 STOP
740 K=VAL(MID$(Q$,X+2,Y-X-2))
750 RETURN
760 PRINT"▓▓ANIMALS SO FAR :▓":X=0:FORI=1TO200
770 IFLEFT$(A$(I),2)<>"£A"THEN820
780 PRINTTAB(20*X);:FORZ=3TOLEN(A$(I))
790 FORZ=3TOLEN(A$(I))
800 IFMID$(A$(I),Z,1)<>"£"THENPRINTMID$(A$(I),Z,1);
810 NEXTZ:PRINT
820 NEXTI:PRINT
830 GOTO370
840 FORI=0TO200:IFA$(I)=""THENIE=I-1:I=200
850 NEXT:OPEN1,1,1,"ANIMAL-FILE":PRINT#1,IE:FORI=0TOIE:PRINT#1,A$(I)
860 PRINTA$(I):NEXT:CLOSE1
870 GOTO350
880 GOSUB910
890 GETA$:IFA$=""THEN890
900 RETURN
```

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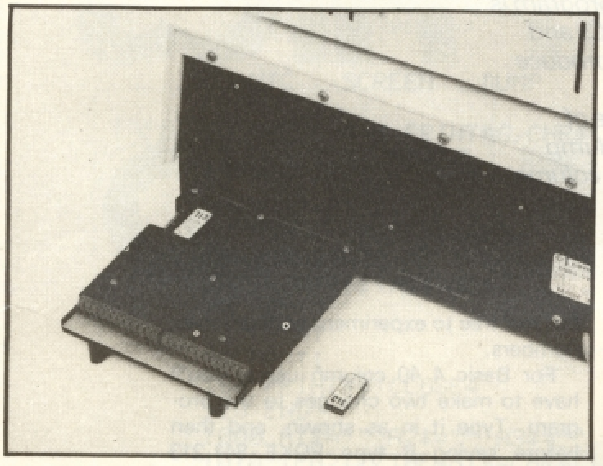

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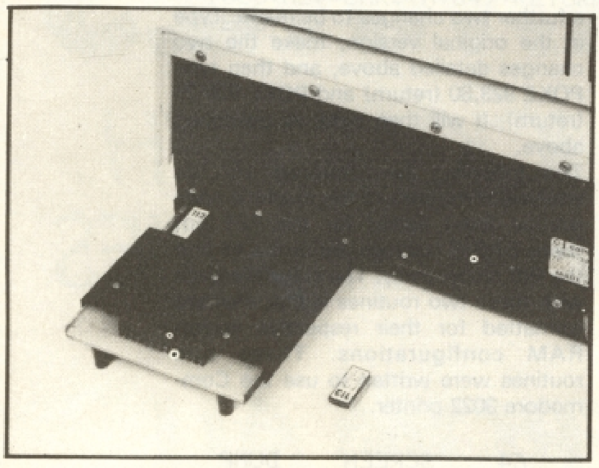

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```
910 PRINTTAB(10)"________":PRINTTAB(9)"<RETURN>":RETURN
920 GETA$:IFA$<>"Y"ANDA$<>"N"THEN920
930 RETURN
940 PRINT"HAVE YOU SAVED THE NEW";
950 PRINT"ANIMALS ON TAPE ?
960 GOSUB920
970 IFA$="Y"THENPRINT"":END
980 GOTO370

READY.
```

Throughout last month's Basic Programming section you'll have seen a number of prints of what is displayed on the screen whilst the program is running. As the programs are designed for a variety of PETs, VICs and Commodore 64s, we've had to develop a suite of programs to produce screen dumps for these various different machines.

Some you'll be familiar with, some you won't but for the sake of completeness we present here the whole collection of screen dump programs, starting off with a machine code program for the 40 column Basic 2 PET.

```
?
.:  033A A9 80 85 20 A9 00 85 1F
.:  0342 A9 04 85 B0 85 D4 20 BA
.:  034A F0 20 2D F1 A9 19 85 22
.:  0352 A9 0D 85 21 20 D2 FF A9
.:  035A 11 AE 4C E8 E0 0C D0 02
.:  0362 A9 91 20 D2 FF A0 00 B1
.:  036A 1F 29 7F AA B1 1F 45 21
.:  0372 10 0B B1 1F 85 21 29 80
.:  037A 49 92 20 D2 FF 8A C9 20
.:  0382 B0 04 09 40 D0 0E C9 40
.:  038A 90 0A C9 60 B0 04 09 80
.:  0392 D0 02 49 C0 20 D2 FF C8
.:  039A C0 28 90 CB A5 1F 69 27
.:  03A2 85 1F 90 02 E6 20 C6 22
.:  03AA D0 A6 A9 0D 20 D2 FF 4C
.:  03B2 CC FF 00 00 00 00 00 00
.
.
READY.
```

Type it in via the monitor as shown, and then whenever you want to reproduce the contents of the screen on the printer simply type SYS826, or perhaps have this as one of the lines of your program. This way, when the printer has finished, control returns to the program again and you just carry on from where you left off.

The program was written to be used with a 3022 printer, and when reproducing graphic images onto that printer you'll have to alter the line spacing first. This is achieved with the statement :-

OPEN 6,4,6 : PRINT$6,CHR$(N) : CLOSE 6

where N determines the line spacing. We used N = 16 for the Pinball program, but feel free to experiment with different numbers.

For Basic 4 40 column users, you'll have to make two changes to the program. Type it in as shown, and then before saving it type POKE 841,213 (return) and POKE 844,72 (return). Then just save the altered version. It works in exactly the same way as the Basic 2 one.

For Basic 4 80 column users, there are a further two changes to be made. Type in the original version, make the two changes detailed above, and then type POKE 923,80 (return) and POKE 929,79 (return). It will then work as described above.

The following two routines are the equivalent routines to the machine code routine listed earlier for the PET but these BASIC routines are fir the 64 and the VIC respectively. The only difference with these two routines is that they are formatted for their respective screen RAM configurations. These two routines were written to use the Commodore 3022 printer.

```
   64      SCREEN      DUMP

10 OPEN6,4,6:PRINT#6,CHR$(18):CLOSE6
15 OPEN4,4:CMD4
20 FORI=0TO24
30 FORJ=0TO39
40 A=PEEK(1024+I*40+J)
50 GOSUB1000
60 PRINTA1$;A2$;A3$;
70 NEXTJ
80 PRINT
90 NEXTI
100 PRINT#4:CLOSE4
```

```
110 END
1000 A1$="":A2$="":A3$=""
1010 IFA>127THENA1$=CHR$(18):A3$=CHR$(146)A=A-128:RETURN
1020 IFA<32THENA2$=CHR$(A+64):RETURN
1030 IFA>31ANDA<64THENA2$=CHR$(A):RETURN
1040 IFA>63ANDA<96THENA2$=CHR$(A+128):RETURN
1050 A2$=CHR$(A+64):RETURN
READY.
```

```
    VIC   SCREEN   DUMP

10 OPEN6,4,6:PRINT#6,CHR$(18):CLOSE6
15 OPEN4,4:CMD4
20 FORI=0TO22
30 FORJ=0TO21
40 A=PEEK(7680+I*22+J)
50 GOSUB1000
60 PRINTA1$;A2$;A3$;
70 NEXTJ
80 PRINT
90 NEXTI
100 PRINT#4:CLOSE4
110 END
1000 A1$="":A2$="":A3$=""
1010 IFA>127THENA1$=CHR$(18):A3$=CHR$(146)A=A-128:RETURN
1020 IFA<32THENA2$=CHR$(A+64):RETURN
1030 IFA>31ANDA<64THENA2$=CHR$(A):RETURN
1040 IFA>63ANDA<96THENA2$=CHR$(A+128):RETURN
1050 A2$=CHR$(A+64):RETURN
READY.
```

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BASIC PROGRAMMING

Also included this month, a maze program that gives you a choice of size of the maze (small, medium, or big) and asks you whether you want to watch the maze being created. When the maze has been completed, you are timed on how long it takes you to get from the entrance (at the top) to the exit (at the bottom). The keys that control the direction that you move through the maze are:

```
DIAGRAM  8
      2  *  6
         4
```

```
  100 PRINT"■⊐":POKE53280,6:POKE53
281,7
  120 POKE53272,21
  140 PRINT"▩▩▩▩▩▩▩▩▩"
  160 PRINT"                   *********
**
  180 PRINT"                   ** ▩ MAZE
  **
  200 PRINT"                   *********
**
  220 PRINT
  240 PRINT
  260 PRINT
  280 FORN=1TO2500:NEXT
  300 PRINT"⊐"
  320 PRINT:PRINT
  340 PRINT"               ▩MAZE - CAN Y
OU ESCAPE?
  360 PRINT:PRINT:PRINT
  380 PRINT"YOU HAVE TO ESCAPE FRO
M THE MAZE IN THE
  400 PRINT"SHORTEST TIME POSSIBLE

  420 PRINT
  440 PRINT"THE CONTROLS ARE THE K
EYS 8,6,4 & 2 FOR
  460 PRINT"UP,DOWN,RIGHT AND LEFT
 RESPECTIVELY.
  461 PRINT:PRINT:PRINT
  462 PRINTTAB(15)"▩GOOD LUCK!▩"
  463 PRINT:PRINT
  464 PRINTTAB(12)"▩KEY G TO CONTI
NUE"
  465 GETG$:IFG$=""THEN465
  466 IFG$<>"G"THEN465
  467 PRINT"⊐"
  560 DIMW(38,22),V(38,22),D(8)
  580 X=RND(-TI)
  600 H=10:V=11
  620 PRINT"DO YOU WANT A SMALL,ME
DIUM, OR BIG MAZE (S/M/B)":INPUTA$

  621 PRINT:PRINT:PRINT
  640 X=ASC(A$):IFX=83GOTO 700
  660 H=15:V=11:IFX=77GOTO 700
  680 H=19:V=11
  700 X=200:FORI=1TOH:W(I,0)=X:NEX
TI
  720 FORI=1TOV:W(0,I)=X:W(H+1,I)=
X:NEXTI
  740 PRINT"▩DO YOU WANT TO WATCH
ME CONSTRUCT IT (Y/N)":INPUTA$
  760 F=0:IFASC(A$)<>89THENF=1
  780 Z=INT(RND(1)*H+1)
  800 PRINT"⊐":PRINT" ";:FORI=1TOH

  820 :A$="__":IFI=ZTHENA$="  "
  840 :PRINTA$;:NEXTI
  860 PRINT
  880 :FORJ=1TOV:PRINT" |";
  900 :  FORI=1TOH:PRINT"  |";:NEXTI

  920 :PRINT:PRINT" |";
  940 FORI=1TOH:PRINT"__|";:NEXTI:P
RINT:NEXTJ
  960 W(Z,1)=1:C=2:R=Z:S=1:GOTO 10
60
```

BASIC PROGRAMMING

```
 980 IFR<>HTHENR=R+1:GOTO 1040
 1000 R=1:IFS<>VTHENS=S+1:GOTO 10
40
 1020 S=1:GOTO 1040
 1040 IFW(R,S)=0GOTO 980
 1060 FORJ=1TO4:D(J)=0:NEXTJ
 1080 D(1)=W(R-1,S)=0
 1100 D(2)=W(R,S-1)=0
 1120 D(3)=W(R+1,S)=0
 1140 D(4)=W(R,S+1)=0AND(C>V*H/20
RS<V)
 1160 D=0:FORJ=1TO4:D=D+D(J):NEXT
J
 1180 IFD=0GOTO 980
 1200 X=RND(1)*D
 1220 FORD=1TO4:X=X-D(D):IFX<0THE
NNEXTD
 1240 ONDGOTO 1280, 1320, 1460, 1
360
 1260 STOP
 1280 R=R-1:V(R,S)=2
 1300 GOTO1340
 1320 S=S-1:V(R,S)=1
 1340 GOSUB2160:GOTO 1500
 1360 IFS<VGOTO 1400
 1380 X=200:FORJ=1TOH:W(J,V+1)=X:
NEXTJ
 1400 V(R,S)=V(R,S)OR1
 1420 GOSUB2160:S=S+1:IFS>VANDC<H
*V+1THENC=C+1:GOTO 1020
 1440 GOTO 1500
 1460 V(R,S)=V(R,S)OR2
 1480 GOSUB2160:R=R+1
 1500 W(R,S)=C:C=C+1
 1520 IFC<H*V+2GOTO 1060
 1540 IFF<>1GOTO1580
 1560 PRINT"███";:FORS=1TOV:PRINT
"█";:FORR=1TOH:GOSUB2220:NEXTR:PRI
NT:PRINT:NEXTS
 1580 R=Z:S=1:GETA$:GETA$:GETA$
 1600 TI$="000000"
 1620 R1=R:S1=S:A$=" ■":GOSUB2100
 1640 PRINT"██";TI$
 1660 GETA$:IFA$=""GOTO 1640
 1680 D=ASC(A$)
 1700 IFD=50GOTO 1840
 1720 IFD=52GOTO 1880
 1740 IFD=54GOTO 1940
 1760 IFD<>56GOTO 1640
 1780 IFS=1GOTO 1640
 1800 IFABS(V(R,S-1)-1)=1GOTO 164
0
 1820 S=S-1:GOTO 1980
 1840 IFABS(V(R,S)-1)=1GOTO 1640
 1860 S=S+1:GOTO 1980
 1880 IFR=1GOTO 1640
 1900 IFV(R-1,S)<2GOTO 1640
 1920 R=R-1:GOTO 1980
 1940 IFV(R,S)<2GOTO 1640
 1960 R=R+1
 1980 A$=" ":GOSUB2100
 2000 IFS<=VGOTO 1620
 2020 PRINT"█████████CONGRATULATIONS!"

 2040 FORJ=1TO1000:NEXT
 2060 GETZ$:IFZ$<>""GOTO2060
 2080 PRINT"██████████████████":
END
```

BASIC PROGRAMMING

```
  2100 PRINT"▒"
  2120 FORJ=1TOS1*2-1:PRINT:NEXT
  2140 FORJ=1TOR1:PRINT"▓▓";:NEXTJ
:PRINT"▓";A$:RETURN
  2160 IFF=1THENRETURN
  2180 PRINT"▒":FORJ=1TOS*2-1:PRIN
T:NEXTJ
  2200 FORJ=1TOR:PRINT"▓▓";:NEXTJ:
PRINT"▓";
  2220 A$="  ":X=V(R,S):IFX<2THENA
$=" ▕"
  2240 PRINTA$;"▓▓▓";:A$="  ":IFX=
2THENA$="__"
  2260 IFX=0THENA$="_▕"
  2280 IFX=1THENA$=" ▕"
  2300 PRINTA$;"▔";:RETURN

READY.
```

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Adding commands to PET BASIC

This article takes up a point mentioned in 'The Pet revealed', showing how to add commands to the PET basic. The PET in this case is the 8k version; in other machines the ROM addresses have been changed. The principle is perfectly general and could be applied to any machine which has a basic interpreter, provided the ROM addresses are known.

The extra commands we have used are nealy all concerned with the printing of blocks of symbols to screen. For example, the command !C48,6: will cause a column of characters with screen-code 48 to be printed in the 6th column from the left. Printers and other peripheral devices could be controlled in this way; altenatively, code could be developed to make good ommissions in PET basic, such as the lack of matrix commands. Another possibility would be to extend the list of available functions—automatic list-sorting, multiplication of permutations, the gamma function. The technique could be extended to the point where one ended up with a new language grafted on to basic, since the essential mechanism is a simple method to distinguish which commands are to be processed as basic, and which to be processed in other ways.

Of course all these things can be done as subroutines in the usual ways. Basic subroutines have the convenience of ease of construction and handling of parameters, machine-code subroutines have the advantage of speed. To introduce a sub-routine as a basic command is to get the best of both worlds.

It is, of course, true that the USR and SYS routines are provided specifically to allow the creation of new, fast subroutines. Their major disadvantage is the inconvenience which arises when trying to handle parameters; this inconvenience is overcome in the method I am about to expound.

The whole idea rests on the fact that on power-up, a subroutine at $E0B5 is loaded into RAM at $00C2. Its function is to fetch the basic program under operation, a character at a time, make one or two checks on the character (for example, spaces are ignored at this stage) and send the text on for further processing in ROM. The fact that the subroutine goes into RAM gives the opportunity to alter it slightly: the new code we used makes a search for the special characters & or ! (we only used two, but up to five are allowed for); if one is found the program is diverted to special subroutines which perform the new commands; otherwise the text is processed in the usual way. This makes the whole operation transparent—if no special characters are used, the user is unaware that any change has been made.

Before going in to details, we shall explain the new commands and the general method of implementation. As mentioned before, up to five special characters are provided for, and these are arranged in a table:

&
!
spare
spare
spare

Each time a new character is fetched, this table is searched to see if the character is a special one. If a special character is detected, the address of the subroutine to which the program must go is found from two other tables, the first for the least significant byte (LSB), the second for the most significant byte (MSB):

LSB for &	MSB for &
MSB for !	MSB for !
spare	spare
spare	spare
spare	spare

The address for & is in fact $1B00, hence the first entry in the LSB table is 00 and in the MSB table is 1B.

In fact ! is only the first symbol of a two-symbol command. The second can be any letter A,B,...,Z , giving 26 possible commands. The subroutine given by the above table for ! merely finds which letter follows the ! and then uses a second set of tables to get the real address of the main subroutine. These tables are arranged as:

LSB for !A	MSB for !A
LSB for !B	MSB for !B
.	.
.	.
LSB for !Z	MSB for !Z

All these subroutines and tables are contained in the top of memory. Since the program is a development program, we have left ourselves plenty of room, and reserved $1A00 upwards for the new software.

The actual commands implemented are as follows.

& This stops everything until the space bar is pressed; in other words it performs the function 'pause'. The R/S key is disabled by this command.

!BX (X is a parameter; details of these are given below) This draws a border around the screen, of characters whose screen-code is X.

!CX,K This prints a column of characters with screen-code X in column no.K.

!XX1,R,C,H,L This prints a block of characters whose screen-code is X1; the block is of height H, length L, with its top left-hand corner in row R column C.

!MM1,X1,R,C,H,L This is as above, but will not overprint the character M1. (M stands for mask.)

Where there are parameters associated with a command, there are certain rules of syntax to be followed.

(i) A parameter can be any real-valued expression.

(ii) If it is a simple variable, or a number, then parentheses are not required.

(iii) All other expressions must be enclosed in parentheses.

(iv) Parameters must be separated by commas or colons.

Hence 6 , K , (LEN(A$)) , (B(S)*SIN(X)) are all acceptable parameters.

When using these commands in programs, the following rules must be observed: if a special command is first in a line, it must be preceded by a colon; if a command stands alone on a line, the line must end with a colon; if a special command is followed by any other command, the two must be separated by a double colon.

!X and !M are clean—that is they eliminate the unpleasant 'noise' associated with fast screen writing on the 8k PET. !B and !C are not. It is interesting to compare the results, using the following program.

```
10 FOR I = 0 TO 255
20 :!BI:
30 NEXT:&:T=10
40 FOR I = 0 TO 255
50 :!XI,T,T,T,T::NEXT
```

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MACHINE CODE

It is recommended that the machine-code is entered using the monitor tape, and saved as a machine-code tape, starting at $1A00 and ending at $2000. In use, this tape is loaded first. The instruction SYS(7947) makes the necessary changes, and also resets certain pointers, allowing basic tapes to be loaded without affecting the extra code, providing the basic tapes do not go beyond $1A00 in memory requirements. Alternatively, a finished basic program and the extra code can be saved as a single tape. This requires a routine in the second cassette buffer to save the tape, and the pointer in decimal locations 124 and 125 must be set to the length of basic program + decimal 1024.

There are two points to make about the machine-code listings. Firstly, it was written to allow for easy alteration, which inevitably means that at times it is inefficient. Secindly, rather than at present the routines in assembler, we chose a method which is easier to enter accurately using a monitor. Each complete command written as a group; the text is arranged in lines, with 'line numbers', the line number being the hex address of the first byte on that line. Subroutines are named by the hex address of their first byte.

It is recommended that the code is entered as follows. Start with subroutines $1P00, $1F0B, 1F60, 1A00, 1B00, and the special tables at $1E00. Save *two* copies as a machine-code tape called EXTRA, from $1A00 to $2000. Switch the PET off and on again. Write a small program incorporating &, after reloading EXTRA and initialising with SYS(7947). If all goes well, start adding to the EXTRA tapes a command at a time. Always make sure that you have two copies of the current working tape, in case further additions spoil one of them.

The original subroutine at $00C2 is as follows.

```
00C2: E6 C9/D0 02/e6 CA/updates
        pointer at C9, CA
  C8: AD * */ this is the pointer
  CB: C9 3A/B0 0A/if character is
        colon or greater,end.
  CF: C9 20/F0 EF/if a space,
        go to 00C2.
  D3: 38/E9 30/38/E9 D0/sets flags for
        character type.
00D9: 60/return.
```

In EXTRA D3 – D9 is replaced by subroutine calls.

```
00D3: 20 00 1A/main subroutine to
        detect extra code.
00D6: 20 00 1F/a direct replacement
        of D3 – D9.
```

In addition, line 00CB above is changed to

```
00CB: C9 3A/F0 0A/so only a colon
        causes the branch.
```

In normal operation the system comes out of ROM to fetch the next character of basic text and then goes back into ROM to decide its next move. With the altered program the operation is this: out of ROM to the changed subroutine at $00C2; at$00D5 branch to $1A00 to decide whether the current character is a special character: if so, branch further into the top of RAM to carry out the instruction, a step which may involve getting more basic text as parameters; if not go briefly back to £00D6 and from there to $1F00 for normal processing; finally back into ROM.

Here is a list of the various subroutines.

$1F00

This replaces 00D3 – 00D9, necessary if no extra code is involved. it also corrects the adjustment to line 00CB.

```
1F00: C9 3A/B0 06/38/E9 30/38/E9 D0/
1F0A:                             60/
```

£1F0B SYS(7947)

This routine, called from basic, makes the necessary changes to 00C2 and adjusts the pointers to allow the loading of basic tapes etc.

```
1F0B: A9 20/85 D3/85 D6/A9 00/85
        D4/85 D7/
1F17: A9 1A/85 D5/A9 1F/85
        D8/alters D3-D9
1F1F: A9 F0/85 CD/changes line 00CB.
1F23: A9 04/85 7C/85 7D/poke
        124,4:poke 125,4.
1F29: A9 FF/85 86/A9 19/85 87/poke
        134,255:poke 135,25.
1F32: 60
```

£1F60 SYS(8032)

This routine, called from basic, restores $00C2 to its original state.

```
1F60: A2 05/BD 04 1F/95 D3/CA/10
        F6/copies from 1F04
  6A: A9 B0/85 CD/corrects line 00CB.
1F6E: 60
```

$1A00

This is the routine which separates the extra code and its processing from ordinary basic. The current character is checked against a table at $1E00, and if found processing branches to other subroutines. Otherwise the character will be dealt with by the basic interpreter.

```
1A00: 08/86 04/status reg. on to
        stack, X reg. to 0004.
  03: A2 04/DD 00 1E/F0 07/CA10
        F8/check for special.
  0D: A6 04/28/60/if not recover SR
        and X and return.
1A11: BD 06 1E/8D 1E 1A/BD 0C
        1E/8D 1F 1A/get LSB and MSB
        of subroutine from tables star-
        ting at 1E06 and 1E0C respec-
        tively; they replace the EA's in
        the next line.
1A1D: 20 EA EA/go to the appropriate
        subroutine.
1A20: E6 C9/D0 02/E6 CA/28/
        advance basic program counter.
  27: A2 00/A1 C9/get next basic
        character.
  2B: A6 04/recover X
1A2D: 60/
```

$1E00 Primary Tables.

The first table contains the ASCII code of the special character, the second the LSB of the subroutine, the third the MSB of the subroutine.

```
1E00: 26/for&, subroutine at 1B00
  01: 21/for!, subroutine at 1B4B
  02: 21
  03: 21
  04: 21
1E06: 00/LSB for &
  07: 4B/LSB for !
1E0C: 1B/MSB for &
  0D: 1B/MSB for !
```

$1B00 code for & (Pause)

This causes operation to be suspended until the space-bar is pressed. The R/S key is ineffective during a pause.

```
$1B00: 20 E4 FF/ROM subroutine 'get'
03:    C9 20/D0 F9/If not 'space' then
       1B00.
1B07:  60/
```

If the 20 in line 1B03 is changed, a different key will end the pause.

$1B4B !

This subroutine gets the next character from the basic text, checks that it is alphabetic, and finds the correct subroutine address from tables at $1C00. If the following character is not alphabetic, the ROM subroutine at CE1C is used to produce an error message.

```
1B4B:  E6 C9/D0 02/E6 CA/A2 00/A1
       C9/get next character
55:    38/E9 41/10 03/4C 1C CE/if
       less than A, error
```

MACHINE CODE

```
5D:    C9 1A/30 03/4C 1C CE/if
       greater than Z, error
64:    AA/BD 00 1C/8D 72 1B/get
       LSB
6B:    BD 1A 1C/8D 73 1B/get MSB
71:    20 EA EA/EA's replaced by
       LSB,MSB
74:    60/
```

$1C00 Table of secondary addresses for ! The first table contains the LSB's, the second, starting at $1C1A, the MSB's. This is indexed by the letter following ! so A corresponds to 1C00 and 1C1A, b corresponds to 1C01 and 1C1B, etc.

```
 1C01: 50/LSB for !B
$1C02: A7/LSB for !C
   0C: B0/LSB for !M
   17: 40/LSB for !X

$1C1B: 1D/MSB for !B
   1C: 1B/MSB for !C
   26: 1C/MSB for !M
   31: 1C/MSB for !X
```

$1BC1 Evaluates expressions and returns value as single byte.
It is the availability of this routine which transforms the idea from an interesting one into a practical one. There is no reason in general for transforming the value of an expression into a single byte, but for screen use it is all that is required.

```
 1BC1: 20 9D CD/ROM evaluation
       routine
   C4: 20 A7 D0/ROM, change to
       double-byte integer
   C7: A5 B4/put LSB into
       accumulator.
 1BC9: 60/
```

$1D50 !B Prints border to screen
This uses $1B30 as storage, and calls $1BCD (see below).

```
 1D50: 20 C1 1B/8D 30 1B/get
       parameter, store in 1B30
   56: A9 01/8D DA 1B/85 06/
   5D: A9 28/8D EC 1B/20 CD
       1B/draws top line
   65: A9 01/85 06/A9 28/8D EC 1B/
   6E: A9 19/8D DA 1B/20 CD 1B/
       draws bottom line.
   76: A9 00/8D 84 1B/
   7B: A9 18/8D 8C 1B/20 81
       1B/draws left-hand side.
   83: A9 27/8D 84 1B/
   88: A9 18/8D 8C 1B/20 81
       1B/draws right-hand side.
 1D90: 60/
```

This also calls $1B81 to draw a vertical line.

$1BCD Prints line to screen.
This is designed for internal use, and parameters are passed to it by the calling subroutines. These parameters are:

Character to be printed, stored in	1B30
First line number, stored in	1BDA
First column number, stored in	0006
Length of line, stored in	1BEC

```
 1BCD: 98/48/A9 D5/65 06/85 06/A9
       7F/85 07
   D9: A2 01/
   DB: 18/A9 28/65 06/85 06/A9
       00/65 07/85 07
   E8: CA/ D0 F0/
   EB: A0 28/AD 30 1B/91 06/88/DO
       FB/68/A8/
 1BF7: 60/
```

$1B81 Draws vertical line.
Again this is used internally. The various parameters are:

Starting position LSB, stored in	1B84
Starting position MSB, stored in	1B88
Length stored in	1B8C
Offset, stored in	1B96

```
 1B81: 98/48/
   83: A9 00/85 06/A9 80/ 85 07/
   8B: A0 17/A2 00/AD 30 1B/81 06/
18/A9 28/65 06/85 06/A9 00/65 07/85
0 7 /
   A1: 88/10 EB/
   A4: 68/A8/
 1BA6: 60/
```

As before, the character to be printed is in 1B30.

$1BA7 !C Draws column.

```
 1BA7: 20 C1 1B/8D 30 1B/evaluate
       character
   AD: 20 C1 1B/8D 84 1B/evaluate
       column
   B3: 20 81 1B/draw
   B6: 60/
```

Here is an example of a basic program incorporating !C.

```
10 FOR I = 1 TO 40: !C(5*I),I::&:NEXT
```

$1C40 !X Prints block to screen.
This is a clean print, hence the interrupts are disabled.

```
 1C40: 78/98/48/
   43: 20 C1 1B/8D 30 1B/evaluate
       character.
   49: 20 C1 1B/8D 34 1C/evaluate
       row
   4F: 20 C1 1B/85 06/evaluate
       column
   55: 20 C1 1B/8D 35 1C/evaluate
       height.
   5B: 20 C1 1B/8D 36 1C/evaluate
       length.
   61: A9 7F/85 07/
   65: 18/A9 D6/65 06/85 06/
   6C: A9 00/65 07/85 07/AE 34 1C/
   75: 18/A9 28/65 06/85 06/A9 00/65
       07/
   80: 85 07/CA/D0 F0/
   85: AE 35 1C/AC 36 1C/
   8B: AD 30 1B/48/20 91 1D/68/wait
       for refresh
   93: 91 06/88/D0 F6/
   98: CA/F0 11/
   9B: 18/A9 28/65 06/85 06/A9 00/
   A4: 65 07/85 07/A9 00/F0 DC/
   AB: 58/68/A8/
 1CAE: 60/
```

This uses the following interrupt subroutine.

$1D91 Interrupt

```
 1D91: AD 40 E8/
   94: 49 20/
   96: 29 20/
   98: F0 F7/
 1D9A: 60/
```

This routine can be used whenever a clean screen-write is required. If used, the X and Y registers must be stacked, or the system may crash. This has been done in the last subroutine.

$1CB0 !M
This subroutine is as ! except that the first parameter acts as a mask; if that is on the screen, then it will not be overprinted.

```
 1CB0: 78/98/48/
   B3: 20 C1 1B/8D 37 1C/evaluate
       mask
   B9: 20 C1 1B/8D 30 1B/evaluate
       character
   BF: 20 C1 1B/8D 34 1C/row
   C5: 20 C1 1B/85 06/column
   CA: 20 C1 1B/8D 35 1C/height
   D0: 20 C1 1B/8D 36 1C/length
   D6: A9 7F/85 07/18/A9 D6/65 06/
   DF: 85 06/A9 00/65 07/85 07/AE 34
       1C/
   EA: 18/A9 28/65 06/85 06/A9 00/65
       07/
   F5: 85 07/CA/D0 F0/AE 35 1C/AC
       36 1C/
 1D00: AD 30 1B/48/20 91 1D/B1
       06/CD 37 1C/
   0C: D0 04/68/18/90 03/
   12: 68/91 06/88/D0 EB/
   18: CA/F0 11/
   1B: 18/A9 28/65 06/85 07/A9 00/65
       07/85 07/
   28: A9 00/F0 D1/
   2C: 58/68/A8/
   2F: 60/
```

This can be changed so that it will *only* overwrite the mask, by the command POKE7436,240. this changes the D0 in line 1D00 to an F0.

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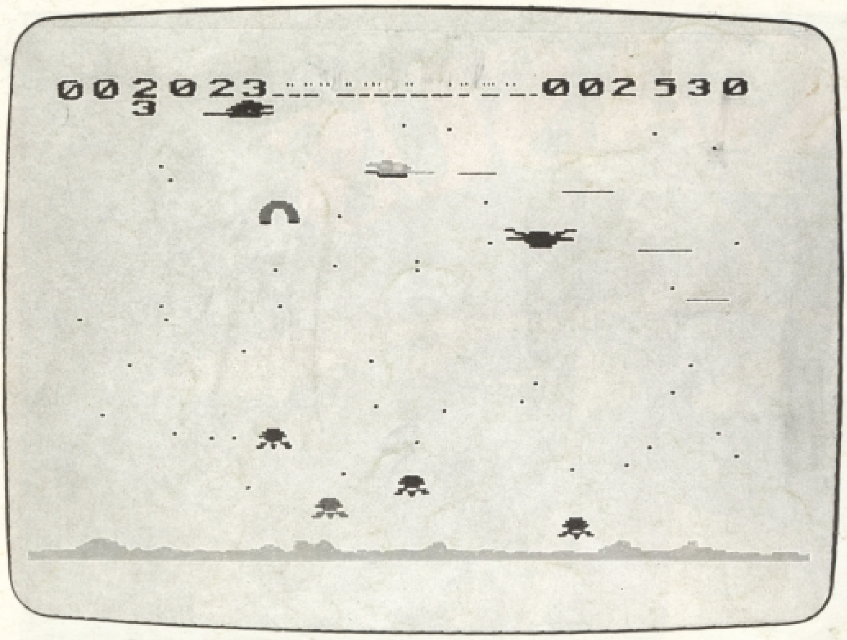

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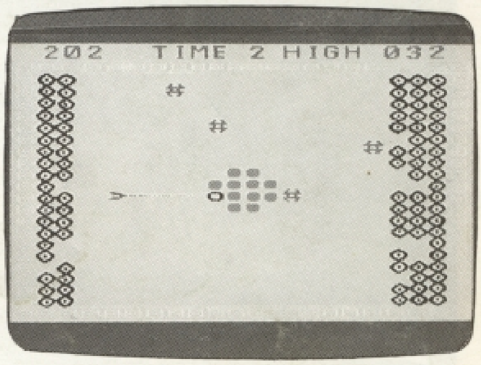

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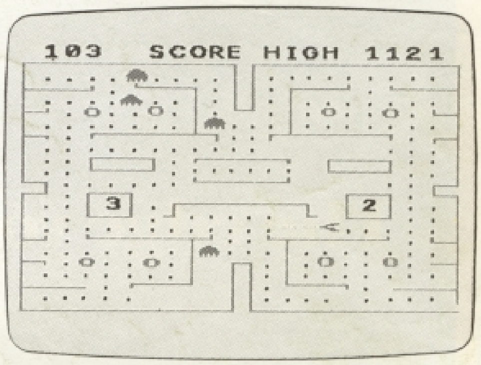

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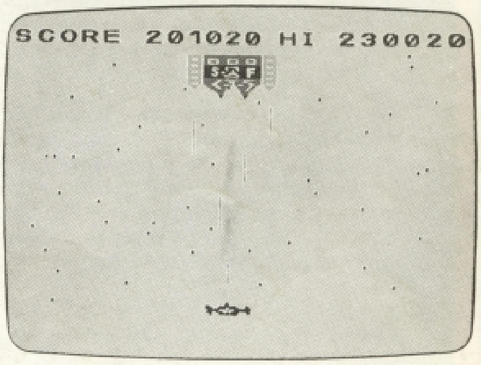

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